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November 1993

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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NASA SP-7011 (381)
November 1993

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

This publication was prepared by the NASA Center for AeroSpace Information,
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INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 89 reports, articles, and other documents recently announced in the NASA STI Database. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue include:

Scientific and Technical Aerospace Reports (STAR) (N-10000 Series)

International Aerospace Abstracts (IAA) (A-10000 Series)

N93-31326 — N93-32425

A93-45451 — A93-49080

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract number, report number, and accession number—are included.

A cumulative index for 1993 will be published in early 1994.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.

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TYPICAL REPORT CITATION AND ABSTRACT

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ACCESSION NUMBER → **N93-12195 * #** Lockheed Engineering and Sciences, Co., Houston, TX. ← **CORPORATE SOURCE**

TITLE → **ASTRONAUT CANDIDATE STRENGTH MEASUREMENT USING THE CYBEX 2 AND THE LIDO MULTI-JOINT 2 DYNAMOMETERS Final Report**

AUTHORS → **AMY E. CARROLL and ROBERT P. WILMINGTON** May 1992 ← **PUBLICATION DATE**

CONTRACT NUMBER → (Contract NAS9-17900)

REPORT NUMBERS → (NASA-CR-185679; NAS 1.26:185679; LESC-30277) Avail: CASI HC ← **AVAILABILITY**

PRICE CODE → A03/MF A01

The Anthropometry and Biomechanics Laboratory in the man-Systems division at NASA's Johnson Space Center has as one of its responsibilities the anthropometry and strength measurement data collection of astronaut candidates. The anthropometry data is used to ensure that the astronaut candidates are within the height restrictions for space vehicle and space suit design requirements, for example. The strength data is used to help detect abnormalities or isolate injuries to muscle groups that could jeopardize the astronauts' safety. The Cybex II Dynamometer has been used for strength measurements from 1985 through 1991. The Cybex II was one of the first instruments of its kind to measure strength and similarity of muscle groups by isolating the specific joint of interest. In November 1991, a LIDO Multi-Joint II Dynamometer was purchased to upgrade the strength measurement data collection capability of the Anthropometry and Biomechanics Laboratory. The LIDO Multi-Joint II Dynamometer design offers several advantages over the Cybex II Dynamometer including a more sophisticated method of joint isolation and a more accurate and efficient computer based data collection system.

Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

ACCESSION NUMBER → **A93-11150**

TITLE → **STUDIES TOWARDS THE CRYSTALLIZATION OF THE ROD VISUAL PIGMENT RHODOPSIN**

AUTHORS → **W. J. DE GRIP, J. VAN OOSTRUM, and G. L. J. DE CALUWE**

AUTHORS' AFFILIATION → (Nijmegen Catholic Univ., Netherlands) Journal of Crystal Growth (ISSN 0022-0248) vol. 122, no. 1-4 Aug. 1992 ← **JOURNAL TITLE**
p. 375-384. Research supported by SRON refs ← **PUBLICATION DATE**

CONTRACT NUMBER → (Contract NWO-SON-328-050)
Copyright

Results are presented of crystallization experiments on bovine rhodopsin, which established a restricted range of conditions which reproducibly yield rhodopsin crystals. Several parameters were optimized, including the detergent, the precipitant, additives, and pH. The crystals obtained so far are too small (less than 50 microns in any direction) or of insufficient order to allow high-resolution diffraction analysis. Several approaches are proposed for improving the average size, stability, and order of the rhodopsin crystals.

I. S.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 381)

November 1993

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LIFE SCIENCES (GENERAL)

A93-45995

EFFECTS OF A MICROGRAVITY ENVIRONMENT ON THE CRYSTALLIZATION OF BIOLOGICAL MACROMOLECULES

A. MCPHERSON (California Univ., Riverside) *Microgravity Science and Technology* (ISSN 0938-0108) vol. 6, no. 2 June 1993 p. 101-109. refs

Copyright

Protein crystal growth experiments in space suggest that macromolecular crystals of sufficient size and quality for X-ray diffraction may be produced in a microgravity environment. It is hypothesized that the absence of density-driven convection and sedimentation is responsible for this improvement over ground-based crystal growth. Microgravity effects that may play a role in protein crystal growth and crystal quality are discussed, and possible mechanisms are suggested. Previous work and experiments in the field are also discussed. AIAA

A93-46075

APPLIED CHEMICAL ENGINEERING THERMODYNAMICS

DIMITRIOS P. TASSIOS (Athens National Technical Univ., Greece) Berlin and New York Springer-Verlag 1993 741 p. refs

(ISBN 0-387-54759-2) Copyright

The present treatment of foundational topics in chemical-engineering thermodynamics covers both the graduate and undergraduate levels. After establishing the general trends of this discipline's historical development, attention is given to the efficient utilization of energy, a limited discussion of intermolecular forces, and the cubic equations of state that have become a major tool in quantitative descriptions of both pure and mixed fluids. The discussion of equilibrium and stability leads to consideration of phase and chemical-reaction equilibria. AIAA

A93-46300

UNDERSTANDING MICROWAVES

ALLAN W. SCOTT (Microwave Training Inst., Los Altos, CA) New York John Wiley & Sons, Inc. 1993 557 p. refs

(ISBN 0-471-57567-4) Copyright

The present work proceeds from a survey of microwave systems and devices to consideration of microwave fields and the quantification of their power, insertion loss and gain characteristics, and Smith-chart matches and mismatches. Attention is then given to such microwave devices as transmission lines, signal-control components, semiconductor amplifiers, oscillators, receivers, integrated circuits, and microwave tubes and antennas. Accounts are finally presented of microwave systems encompassing relays, communications satellites, radars, electronic warfare devices and countermeasures, and microwave navigation aids. AIAA

A93-46468* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

EFFECTS OF INCANDESCENT RADIATION ON PHOTOSYNTHESIS, GROWTH RATE AND YIELD OF 'WALDMANN'S GREEN' LEAF LETTUCE

SHARON L. KNIGHT and CARY A. MITCHELL (Purdue Univ., West Lafayette, IN) *Scientia Horticulturae* (ISSN 0304-4238) vol. 35 1988 p. 37-49. refs

(Contract NCC2-150)

Copyright

Effects of different ratios of incandescent (In) to fluorescent (Fl) radiation were tested on growth of 'Waldmann's Green' leaf lettuce in a controlled environment. After 4 days of treatment, dry weight, leaf area, relative growth rate (RGR), net assimilation rate (NAR), leaf area ratio (LAR) and photosynthetic rate (Pn) were greater for plants grown at 84 rather than 16 percent of total irradiance (82 W/sq m) from In lamps. Although leaf dry weight and area were 12-17 percent greater at 84 percent In after the first 8 days of treatment, there were no differences in RGR or Pn between treatments during the last 4 days. If 84 percent In was compared with 50 percent In, all cumulative growth parameters, RGR, NAR and Pn were greater for 84 percent In during the first 4 days of treatment. However, during the second 4 days, RGR was greater for the 50 percent In treatment, resulting in no net difference in leaf dry weight or area between treatments. Shifting from 84 to 50 percent In radiation between the first and second 4 days of treatment increased plant dry weight, leaf area, RGR and NAR relative to those under 84 percent In for 8 days continuously. Author (revised)

A93-46469* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

GROWTH AND YIELD CHARACTERISTICS OF 'WALDMANN'S GREEN' LEAF LETTUCE UNDER DIFFERENT PHOTON FLUXES FROM METAL HALIDE OR INCANDESCENT + FLUORESCENT RADIATION

SHARON L. KNIGHT and CARY A. MITCHELL (Purdue Univ., West Lafayette, IN) *Scientia Horticulturae* (ISSN 0304-4238) vol. 35 1988 p. 51-61. refs

(Contract NCC2-100)

Copyright

Growth of 'Waldmann's Green' leaf lettuce under metal halide radiation was compared with that under In = Fl at the same photosynthetic photon flux (920 micromol/s/sq m) to evaluate the influence of lamp type on growth. No differences in leaf dry weight, leaf area, relative growth rate or photosynthesis occurred after 8 days of exposure to these radiation treatments for 20 h/day. AIAA

A93-46470* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

MINITRON II SYSTEM FOR PRECISE CONTROL OF THE PLANT GROWTH ENVIRONMENT

SHARON L. KNIGHT, CAROLYN P. AKERS, S. W. AKERS, and CARY A. MITCHELL (Purdue Univ., West Lafayette, IN) *Photosynthetica* (ISSN 0300-3604) vol. 22 1988 p. 90-98. refs

(Contract NCC2-100)

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The Minitron II system which accommodates hydroponic culture

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and separate control of atmospheric composition in individual chambers is used to measure gas-exchange by small crop canopies in the undisturbed plant growth environment. It is concluded that the system is capable of providing separate controlled environments for multiple small plants with adequate precision and at relatively low cost when coupled with appropriate control systems. AIAA

A93-46471* National Aeronautics and Space Administration, Washington, DC.

THE MINITRON SYSTEM FOR GROWTH OF SMALL PLANTS UNDER CONTROLLED ENVIRONMENT CONDITIONS

CAROLYN P. AKERS, STUART W. AKERS, and CARY A. MITCHELL (Oklahoma State Univ., Stillwater) American Society for Horticultural Science, Journal (ISSN 0003-1062) vol. 110, no. 3 May 1985 p. 353-357. refs
(Contract NSG-7278)
Copyright

The design and operation of a system is described in which small plants can be grown under controlled environment conditions. Important features of this 'Minitron' system include precise control of temperature and CO₂ concentration in a flowing atmosphere. Plants can be grown either hydroponically or in solid root support medium. For either culture method, nutrient solution or water is added from an external reservoir, altering neither atmospheric composition nor temperature equilibrium within a closed Minitron chamber.

A93-46472* National Aeronautics and Space Administration, Washington, DC.

DYNAMICS OF AUXIN MOVEMENT IN THE GRAVISTIMULATED LEAF-SHEATH PULVINUS OF OAT (AVENA SATIVA)

THOMAS C. BROCK, E. H. KAPEN (Michigan Univ., Ann Arbor), NAJATI S. GHOSHEH (East Michigan Univ., Ypsilanti, MI), and PETER B. KAUFMAN (Michigan Univ., Ann Arbor) Journal of Plant Physiology (ISSN 0176-1617) vol. 138 1991 p. 57-62. refs
(Contract NAGW-1600)
Copyright

The role of auxin redistribution in the graviresponse of the leaf-sheath pulvinus of oat was evaluated using H-3-indole-3-acetic acid (H-3-IAA) preloaded into isolated pulvini. Results obtained reveal that, while lateral transport of auxin occurs following gravistimulation, it is not necessary for a graviresponse. Localized changes in tissue responsiveness or the conversion of conjugated hormone to free hormone may suffice to drive the graviresponse. AIAA

A93-46606

HETEROGENEITY OF RAT PITUITARY PROLACTIN CELLS - RELATIONSHIPS AMONG LOCATION, HORMONE ASSAY AND ESTROUS CYCLE STAGE

P. MUKHERJEE and W. C. HYMER (Pennsylvania State Univ., University Park) Progress in Neuroendocrin Immunology (ISSN 1045-2001) vol. 5, no. 2 1992 p. 108-119. refs
(Contract NIH-CA-23248)
Copyright

A technique permitting the study of cells in single pituitary glands under conditions in which they are in contact with their natural neighbors has been applied to GH cells in the male and to prolactin cells in the ovariectomized and estrogenized female. This approach is to study regional differences in prolactin cells as related to stages of the estrous cycle. Pituitary glands from individual rats at estrus, diestrus or proestrus were sectioned into 8 cubes and incubated for 15 min; released prolactin was measured by ELISA, Nb-2 lymphoma bioassay, and IL-2 receptor (IL-2R) assay. Prolactin cell numbers in each tissue section were determined on trypsinized cell suspension by flow cytometric immunofluorescence. Prolactin release among certain sections differed consistently regardless of the estrous status. The dorsal lobe of the diestrus pituitary usually contained the most active prolactin cells; however, as estrogen levels rose during proestrus

and estrus, prolactin cells in the ventral region became more active. Patterns of immunoreactive and bioactive prolactin release did not parallel one another. Prolactin active on a T-lymphocyte tumor cell line (the Nb-2 bioassay) did not always show the same high activity when measured by the IL-2R induction assay.

Author (revised)

A93-47099

RELATIONSHIP BETWEEN G + C IN SILENT SITES OF CODONS AND AMINO ACID COMPOSITION OF HUMAN PROTEINS

D. W. COLLINS and T. H. JUKES (California Univ., Berkeley) Journal of Molecular Evolution (ISSN 0022-2844) vol. 36, no. 3 March 1993 p. 201-213.
(Contract PHS-R01-HG-00312-03)
Copyright

We have investigated the relationship between the G + C content of silent (synonymous) sites in codons and the amino acid composition of encoded proteins for approximately 1,600 human genes. There are positive correlations between silent site G + C and the proportions of codons for Arg, Pro, Ala, Trp, His, Gln, and Leu and negative ones for Tyr, Phe, Asn, Ile, Lys, Asp, Thr, and Glu. The median proteins coded by groups of genes that differ in silent-site G + C content also differ in amino acid composition, as do some proteins coded by homologous genes. The pattern of compositional change can be largely explained by directional mutation pressure, the genetic code, and differences in the frequencies of accepted amino acid substitutions; the shifts in protein composition are likely to be selectively neutral.

A93-47100

CHANGES IN THE PHOSPHOLIPID AND CHOLESTEROL CONTENT OF RAT TISSUES DURING ADAPTATION TO HIGH ALTITUDE AT DIFFERENT ENVIRONMENTAL TEMPERATURES

V. A. TERNOVOJ and V. M. YAKOVLEV Zhurnal Evolyutsionoi Biokhimii i Fiziologii (ISSN 0044-4529) vol. 29, no. 1 Jan.-Feb. 1993 p. 22-26. In RUSSIAN
Copyright

Studies have been made on the contents of total lipids, cholesterol, phospholipids and the level of lipid peroxidation in rats adapted to a high altitude (3,200 m for 30 days) at temperatures 10 and 30 degrees C. It was shown that at lower temperature, high altitude adaptation is paralleled by more significant activation of lipid peroxidation, the decrease of phosphatidylcholine and phosphatidylethanolamine in the brain, lungs and liver, as well as by the increase of the content of phosphatidic acid and phosphatidylinositol in tissues. No negative cross-adaptation was found to hypoxic hypoxia and low temperatures.

N93-32035 Catholic Univ. of America, Washington, DC. Vitreous State Lab.

MECHANISMS OF MICROWAVE INDUCED DAMAGE IN BIOLOGIC MATERIALS Final Report, 22 Sep. 1986 - 21 Sep. 1992

T. A. LITOVITZ 1 Oct. 1992 92 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAMD17-86-C-6260)
(AD-A264415) Avail: CASI HC A05

Concerns over the possibility that exposure to electromagnetic fields can have adverse health consequences has prompted research into the mechanism of interaction between electromagnetic fields and living cells. A six-year study at the Catholic University of America has included experimental and theoretical studies that attempt the following: (1) to firmly establish whether or not there are, in fact, any athermal effects on living cells that can be attributed to exposure to electromagnetic fields; (2) to determine and explain the dose-response relationship between bioeffects and EM field parameters; and (3) to discover how biologic cells can detect very weak ambient fields which are much smaller than intrinsic EM noise fields always present. In this

work we report that significant contributions have been made to each of the three areas described above. DTIC

N93-32354*# Sverdrup Technology, Inc., Huntsville, AL.
MICROBIOLOGICAL TEST RESULTS OF THE ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS VAPORS COMPRESSION DISTILLATION SUBSYSTEM RECYCLE TANK COMPONENTS FOLLOWING VARIOUS PRETREATMENT PROTOCOLS

TIM HUFF Jul. 1993 9 p
 (Contract NAS8-37814)
 (NASA-CR-192570; NAS 1.26:192570) Avail: CASI HC A02/MF A01

Microbiological samples were collected from the recycle tank of the vapor compression distillation (VCD) subsystem of the water recovery test at NASA MSFC following a 68-day run. The recycle tank collects rejected urine brine that was pretreated with a commercially available oxidant (Oxone) and sulfuric acid and pumps it back to the processing component of the VCD. Samples collected included a water sample and two swab samples, one from the particulate filter surface and a second from material floating on the surface of the water. No bacteria were recovered from the water sample. Both swab samples contained a spore-forming bacterium, *Bacillus insolitus*. A filamentous fungus was isolated from the floating material. Approximately 1 month after the pretreatment chemicals were changed to sodium hypochlorite and sulfuric acid, a swab of the particulate filter was again analyzed for microbial content. One fungus was isolated, and spore-forming bacteria were observed. These results indicate the inability of these pretreatments to inhibit surface attachment. The implications of the presence of these organisms are discussed. Author (revised)

N93-32365*# Sverdrup Technology, Inc., Huntsville, AL.
OPTIMIZATION OF 15 PARAMETERS INFLUENCING THE LONG-TERM SURVIVAL OF BACTERIA IN AQUATIC SYSTEMS

D. C. OBENHUBER Jul. 1993 21 p
 (Contract NAS8-37814)
 (NASA-CR-192571; NAS 1.26:192571) Avail: CASI HC A03/MF A01

NASA is presently engaged in the design and development of a water reclamation system for the future space station. A major concern in processing water is the control of microbial contamination. As a means of developing an optimal microbial control strategy, studies were undertaken to determine the type and amount of contamination which could be expected in these systems under a variety of changing environmental conditions. A laboratory-based Taguchi optimization experiment was conducted to determine the ideal settings for 15 parameters which influence the survival of six bacterial species in aquatic systems. The experiment demonstrated that the bacterial survival period could be decreased significantly by optimizing environmental conditions. Author

N93-32423# National Defence Research Establishment, Umea (Sweden). NBC Defence Dept.

MICRO-ORGANISMS, CYTOTOXINS AND RADIOACTIVE PREPARATION: RISKS AT RESCUE OPERATIONS IN HOSPITAL ENVIRONMENT [MIKROORGANISMER, CYTOSTATIKA, RADIOAKTIVA PREPARAT: RISKER VID RAEDDNINGSINSATS I SJUKHUSMILJOE]

INDRA SVENSSON Aug. 1992 32 p In SWEDISH
 (ISSN 0281-0220)
 (FOA-A-40065-4.5; ETN-93-94028) Avail: CASI HC A03/MF A01; National Defence Research Establishment, S-901 82 Umea, Sweden, HC

The development of society leads to an increased handling of microorganisms, cytotoxins, and radiological preparations in pharmacies, hospital institutions, and in certain factories. The question of whether these organisms/subjects imply special risks for the staff of the rescue board when working in these types of premises is addressed. ESA

AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A93-45691

SOME CHARACTERISTICS OF THE ETIOPATHOGENESIS OF HEARING LOSS IN AIRCRAFT PERSONNEL [NEKOTORYE OSOBNOSTI EHTIOPATOGENEZA SNIZHENIYA SLUKHA U LETNOGO SOSTAVA]

V. R. GOFMAN and A. A. MIL'KOV Voenno-Meditsinskij Zhurnal (ISSN 0026-9050) no. 3 March 1993 p. 47-49. In RUSSIAN refs

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The primary causes of neurosensory hearing loss in aircraft personnel were investigated by conducting a three-year study of level of hearing in pilots of different ages, health condition, and flying record, using parameters of tonal audiometry and results of whisper tests as indices of hearing level. The observations detected a type of perceptible hearing loss that was not related to previously occurring acute illnesses, such as otitis media, cranial injuries, or acute barotraumas. However, a direct correlation was found between the degree of hearing loss and the accumulated flying time. All affected subjects also exhibited one or more symptoms of other pathological conditions, including cervical osteochondrosis, diseases of the gastrointestinal tract, asthenoneurotic conditions, and neurocirculatory hypertony, which were also related to the total hours of flying. Some of these conditions also occurred in subjects not exhibiting hearing loss. AIAA

A93-45692

A MODIFIED METHOD FOR INVESTIGATING GASTRIC SECRETION IN AVIATION MEDICAL EXAMINATION [MODIFITSIROVANNYJ METOD ISSLEDOVANIYA ZHELUDOCHNOJ SEKRETSII PRI VRACHEBNO-LETNOJ EKSPERTIZE]

S. N. TOBOLIN and V. M. LUFT Voenno-Meditsinskij Zhurnal (ISSN 0026-9050) no. 3 March 1993 p. 49-51. In RUSSIAN refs

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A method for the assessment of the gastric secretory function from the analysis of stomach contents is proposed, in which the modified Bykov method (Miasoedov, 1958) is modified again, mainly by introducing a periodic (rather than continuous) method for collecting gastric juice. This method produced reliable results, yet resulted in shortening of the analysis procedure by one half. AIAA

A93-46967

CHANGES IN THE CENTRAL HEMODYNAMICS UNDER ANTIORTHOSTASIS IN HUMANS WITH DIFFERENT BLOOD CIRCULATION TYPES AND PHYSICAL TRAINING LEVELS [IZMENENIE TSENTRAL'NOJ GEMODINAMIKI PRI ANTIORTOSTATICHESKIKH VOZDEJSTVIYAKH U LYUDEJ S RAZLICHNYMI TIPAMI KRVVOOBRAZHCENIYA I UROVNEM FIZICHESKOJ PODGOTOVLENNOSTI]

V. A. TSYBENKO (Kievskij Gosudarstvennyj Univ., Kiev, Ukraine) and A. V. GRISHCHENKO (Cherkasskij Pedagogicheskij Inst., Cherkassy, Ukraine) Fiziologiya Cheloveka (ISSN 0131-1646) vol. 19, no. 3 May-June 1993 p. 100-105. In RUSSIAN refs

The roles of physical training and type of blood circulation in humans in the reaction of central hemodynamics to antiorthostasis were investigated by comparing the plethysmographic parameters of central hemodynamics in athletes with those in nonathletes subjected to antiorthostasis (for up to 10 min) after a period of rest. It was found that the athletes and nonathletes differed little in their reaction to antiorthostasis (initial increases in the heart index, HI, pulse index, PI, and systolic arterial pressure and

decreases in the general peripheral vessel resistance, GPVR, with subsequent decreases of HI and PI and increases in GPVP). These indexes reacted differently in subjects with hyperkinetic, eukinetic, and hypokinetic types of blood circulation. AIAA

A93-46968

ELECTROMYOGRAPHIC PATTERNS OF THE THERMOREGULATORY ACTIVITY OF MOTOR UNITS DURING COOLING OF THE ORGANISM

[EHLEKTROMIOGRAFIKESKIE PATTERN]

TERMOREGULYATSIONNOJ AKTIVNOSTI DVIKATEL'NYKH EDINITS V PROTSESSE OKHLAZHDENIYA ORGANIZMA]

A. YU. MEJGAL, YU. V. LUPANDIN, and G. I. KUZ'MINA (Petrozavodskij Gosudarstvennyj Univ., Petrozavodsk, Russia) Fiziologiya Cheloveka (ISSN 0131-1646) vol. 19, no. 3 May-June 1993 p. 106-114. In RUSSIAN refs

Copyright

The function of individual motor units (MUs) within various patterns of muscular thermoregulatory activity induced in humans by cooling of the body was investigated using results of skin electromyography. It is found that the thermoregulatory muscle tonus in the initial phase of the reaction to cooling is formed on the basis of asynchronous pulsations of slow, low-threshold MUs, with frequencies of 8-11 and 4-7 pulses per second in muscles of the upper and the lower extremities, respectively. The electromyographic pattern of cold tremor is generated on the basis of periodic recruiting of high-threshold MUs. In addition, a pattern generated on the basis of long-term synchronization of active MUs, forming a conelike cold tremor pattern, was observed. The possible mobility correlates in the organization of the MU activity at different stages of body cooling are discussed. AIAA

A93-47096

ARTERIAL PULSE PRESSURE AND VASOPRESSIN RELEASE IN HUMANS DURING LOWER BODY NEGATIVE PRESSURE

P. NORSK, P. ELLEGAARD, R. VIDEBAEK, C. STADEAGER, F. JESSEN, L. B. JOHANSEN, M. S. KRISTENSEN, M. KAMEGAI, J. WARBERG, and N. J. CHRISTENSEN (Danish Aerospace Medical Centre of Research, Copenhagen, Denmark) American Journal of Physiology (ISSN 0002-9513) vol. 264, no. 5, pt. 2 May 1993 p. R1024-R1030.

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The hypothesis that narrowing of arterial pulse pressure (PP) is a determinant of arginine vasopressin (AVP) release in humans is tested. Six normal males completed a two-step lower body negative pressure (LBNP) protocol of -20 and -50 mmHg, respectively, for 10 min each. None of these subjects experienced presyncopal symptoms. Arterial plasma AVP and plasma renin activity (PRA) only increased subsequent to a decrease in PP (invasive brachial arterial measurements) and stroke volume; mean arterial pressure did not change. A selective decrease in central venous pressure and left atrial diameter at LBNP of -20 mmHg did not affect AVP or PRA, whereas arterial plasma norepinephrine increased ($n = 4$). During LBNP, significant intraindividual linear correlations were observed between $\log(\text{AVP})$ and PP in four of the subjects with r values from -0.75 to -0.99 and between $\log(\text{PRA})$ and PP in all six subjects with r values from -0.89 to -0.98. These results are in compliance with the hypothesis that narrowing of PP in humans during central hypovolemia is a determinant of AVP and renin release. Author (revised)

A93-47097

EFFECT OF SPACEFLIGHT ON HUMAN PROTEIN METABOLISM

T. P. STEIN, M. J. LESKIW, and M. D. SCHLUTER (New Jersey Univ. of Medicine and Dentistry, Camden) American Journal of Physiology (ISSN 0002-9513) vol. 264, no. 5, pt. 1 May 1993 p. E824-E828.

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Nitrogen balance and the whole body protein synthesis rate were measured before, during, and after a 9.5-day spaceflight mission on the space shuttle Columbia. Protein synthesis was measured by the single-pulse ^{15}N /glycine method. Determinations

were made 56, 26, and 18 days preflight, on flight days 2 and 8, and on days 0, 6, 14, and 45 postflight. We conclude that nitrogen balance was decreased during spaceflight. The decrease in nitrogen balance was greatest on the 1st day when food intake was reduced and again toward the end of the mission. An approximately 30 percent increase in protein synthesis above the preflight baseline was found for flight day 8 for all 6 subjects (P below 0.05), indicating that the astronauts showed a stress response to spaceflight. Author (revised)

A93-47098

SPECIFIC ABSORPTION RATE AND RADIOFREQUENCY CURRENT-TO-GROUND IN HUMAN MODELS EXPOSED TO NEAR-FIELD IRRADIATION

R. G. OLSEN and T. A. GRINER (U.S. Navy, Naval Aerospace Medical Research Lab., Pensacola, FL) Health Physics (ISSN 0017-9078) vol. 64, no. 6 June 1993 p. 633-637.

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To expand our knowledge of near-field radiofrequency energy absorption in occupationally exposed workers, we used coffin-sized calorimeters to measure specific absorption rate in full-size human models. The models were subjected to near-field irradiation at two frequencies at an outdoor groundplane facility. We also measured radiofrequency current-to-ground in the models to supplement a previous study at 29.9000 MHz. The results have enabled us to construct a frequency-independent mathematical relationship between specific absorption rate and radiofrequency current for the given exposure system. Moreover, the results show a favorable comparison to radiofrequency radiation dosimetry handbook predictions of average specific absorption rate when only the vertical electric field (E-field) component is used to normalize specific absorption rate. Once determined on a case-by-case basis, the use of specific absorption rate vs. radiofrequency current curves for any exposure system or condition could be a simple and quick method to determine onsite compliance with specific absorption rate-based exposure standards.

N93-31454*# McDonnell-Douglas Space Systems Co., Houston, TX.

HYPERBARIC TREATMENT

MICHAEL T. AMOROSO In its Workshop on Fuzzy Control Systems and Space Station Applications p 391-411 Nov. 1990 Avail: CASI HC A03/MF A04

Viewgraphs on hyperbaric treatment are presented. Topics covered include: hyperbaric treatment - purpose; decompression sickness; sources of decompression sickness; physical description; forms of decompression sickness; hyperbaric treatment of decompression sickness; and duration of treatment. CASI

N93-31455*# McDonnell-Douglas Space Systems Co., Houston, TX.

DAILY EXERCISE ROUTINES

PATRICK L. ANDERSON and MICHAEL T. AMOROSO In its Workshop on Fuzzy Control Systems and Space Station Applications p 413-418 Nov. 1990 Avail: CASI HC A02/MF A04

Viewgraphs on daily exercise routines are presented. Topics covered include: daily exercise and periodic stress testings; exercise equipment; physiological monitors; exercise protocols; physiological levels; equipment control; control systems; and fuzzy logic control. CASI

N93-31917# Army Research Inst. of Environmental Medicine, Natick, MA.

AN ANNOTATED BIBLIOGRAPHY OF RESEARCH INVOLVING WOMEN, CONDUCTED AT THE US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE Final Report

JAMES A. VOGEL and ANITA K. GAUGER 1993 65 p (AD-A265497) Avail: CASI HC A04/MF A01

Recently, considerable attention has been given to the lack of biomedical research on women's health problems. Within the military services, this concern for lack of research with women or lack of inclusion of women subjects in research has been extended

to most areas of human performance investigation. As women move into an increasing number of military occupations, it is apparent most military research on health and performance has been conducted on male research volunteers. The many anthropometric, body compositional, physiological, and endocrinological differences between genders make it obvious that much of the male research data can not be readily extrapolated to females. Although this issue has only recently received broad attention, the U.S. Army Research Institute of Environmental Medicine (USARIEM) has already executed many studies which either addresses women-related issues or include women in the study population. This report is a bibliography of these studies, complete with abstracts, intended to serve as a convenient resource for women-related health and performance research information. It is anticipated that these references will prompt additional biomedical research related to women in the military.

DTIC

N93-31924* National Aeronautics and Space Administration, Washington, DC.

AEROSPACE MEDICINE AND BIOLOGY: A COINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 377)

Jul. 1993 82 p

(NASA-SP-7011(377); NAS 1.21:7011(377)) Avail: CASI HC A05

This bibliography lists 223 reports, articles, and other documents recently introduced into the NASA Scientific and Technical Information System. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance.

Author (revised)

N93-31981# North Carolina Univ., Chapel Hill. Div. of Otolaryngology.

AUDITORY SPECTRO-TEMPORAL PATTERN ANALYSIS Final Report, 1 Dec. 1989 - 31 Dec. 1992

JOSEPH W. HALL 15 Mar. 1993 11 p

(Contract AF-AFOSR-0108-90)

(AD-A264691; AFOSR-93-0252TR) Avail: CASI HC A03/MF A01

The long-term aim of this project was a better understanding of auditory processes which use across-frequency or across-ear temporal envelope and modulation difference cues to aid performance. Areas of investigation included comodulation masking release (CMR), the masking-level difference (MLD), temporal resolution, and the processing of amplitude and frequency modulation. The goals of the proposed experiments were to (1) examine the possible relation between CMR and auditory phenomena related to auditory grouping, or auditory scene analysis; (2) examine how CMR and MLD effects combine, and to examine the possible relation between CMR and the MLD for narrowband noise maskers; (3) to determine the extent to which across-frequency correlation of temporal envelopes may influence gap detection for wideband stimuli; (4) determine whether masking release can be derived from cues based upon across frequency coherence of frequency modulation; (5) examine a modulation masking phenomenon related to frequency modulation. The tasks involved signal detection in masking noise, temporal gap detection, and the detection of frequency modulation.

DTIC

N93-32015# Pittsburgh Univ., PA. Dept. of Psychiatry.

ORGANIZATION OF THE HUMAN CIRCADIAN SYSTEM Final Report, 1 Feb. 1991 - 31 Jan. 1993

ROBERT Y. MOORE 31 Jan. 1993 10 p

(Contract AF-AFOSR-0175-91)

(AD-A264675; AFOSR-93-0336TR) Avail: CASI HC A02/MF A01

In brains obtained from late gestation fetuses (33-36 weeks), newborns, and young individuals to approximately age 50, the SCN is virtually always identifiable as a discrete nucleus with clear boundaries. From age 50-90, it is sometimes evident and sometimes not evident in the material. We have completed analysis of 22 hypothalami prepared for immunocytochemistry, including quantitative analysis. Sections are routinely stained for VIP, VP, NPY, and NT. This analysis has revealed several interesting aspects

of the human SCN. First, in contrast to what is found in Nissl material, the SCN is always evident as a distinct nucleus in immunocytochemical material. Second, it appears as the first component of the hypothalamus to be found in a rostrocaudal set of coronal sections. Third, the human SCN is characterized by four separate populations of neurons that have different peptide content. These neuronal populations have a different distribution in the nucleus. In contrast to all other mammals, the human SCN contains a population of NPY + neurons that overlaps the VIP + group but extends dorsally beyond it in the center on the SCN. Among the NPY + neurons are scattered coarse fibers and varicosities and a fairly dense plexus of very fine fibers and small varicosities. These are very similar in morphology to GHT projections in other mammals, particularly the cat, and monkey.

DTIC

N93-32018# Dalhousie Univ., Halifax (Nova Scotia). Dept. of Psychology.

NEUROPHYSIOLOGICAL ANALYSIS OF CIRCADIAN RHYTHM ENTRAINMENT Final Report, 1 Jan. 1990 - 31 Dec. 1992

BENJAMIN RUSAK 30 Mar. 1993 15 p

(Contract AF-AFOSR-0104-90)

(AD-A264681; AFOSR-93-0335TR) Avail: CASI HC A03/MF A01

We review recent studies in our laboratory which have investigated the neural mechanisms underlying photic entrainment of the mammalian circadian system. The results from studies of extracellular single-unit recordings and of photic induction of Fos-like immunoreactivity (-lir) indicate that excitatory amino acid (EAA) transmission, and particularly, activation of the NMDA receptor subtype, is important for conveying photic information to suprachiasmatic nucleus (SCN) cells. We have also found that a sub-region of the SCN still shows Fos-lir after blockade of EAA receptors, and we have evidence suggesting that these cells are innervated by a distinct subdivision of the retinal projection to the SCN. In addition, we have found that photic responses of cells in the intergeniculate leaflet (which projects to the SCN) and of SCN cells are modulated by serotonin via a receptor that resembles the 5HT1A subtype.

DTIC

N93-32237 Institute of Sound and Vibration Research, Southampton (England). Audiology and Human Effects Group.

TRANSMISSION OF VIBRATION THROUGH THE HUMAN BODY TO THE HEAD: A SUMMARY OF EXPERIMENTAL DATA

GURMAIL S. PADDAN and MICHAEL J. GRIFFIN May 1993

163 p Sponsored by the UK Ministry of Defence

(ISVR-TR-218) Copyright Avail: Issuing Activity (Institute of Sound and Vibration Research, University of Southampton, Southampton SO9 5NH, England)

The transmission of vibration through the human body to the heads of seated and standing persons is presented. For seated subjects, the transmission of vibration to the head is documented for each of the six orthogonal axes of seat motion (fore-and-aft, lateral, vertical, roll, pitch, and yaw). For standing subjects, the transmission of vibration to the head is documented for three translational axes of floor vibration. In all cases, the head motion was measured in all six axes. Twelve adult male subjects took part in these experiments. The effects of sitting posture and standing posture on transmissibility were determined. The postures for the sitting condition were 'back-on' (leaning slightly against the seat backrest). Different postures were used for each axis of floor vibration with the standing subjects: holding a handrail with two different grips during exposure to fore-and-aft vibration; standing with three different foot separations during exposure to lateral vibration; standing with three different postures of the legs during exposure to vertical vibration. Median transmissibilities and the inter-quartile ranges of transmissibilities were calculated between the input motion (seat or floor acceleration) and head motion. These data are presented in graphical and tabular form.

Author

N93-32249# Service de Medecine Aeronautique, Versailles (France).

LIPODYSTROPHIES IN THE FRENCH MILITARY FLIGHT CREW [LES DYSLIPIDEMIES DANS LE PERSONNEL NAVIGANT MILITAIRE FRANCAIS]

A. SEIGNEURIC, J. P. BURLATON, J. DEROCHE, R. RICHARD, and A. BOUSSIF /in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 5 p Mar. 1993 In FRENCH
Copyright Avail: CASI HC A01/1AF A03

Disorders of the lipid metabolism in the French flight crew were evaluated beginning with a population having aeronautical expertise who were hospitalized between 1980 and 1989. An anomaly: -pure hypertriglyceridemia (hyper TGD) - mixed lipodystrophy - isolated hypercholesterolemia (hyper CT), were recognized in 52.3% of the cases (483/923). A hyper CT with an elevated risk was confirmed in 34.8% of the cases (294/923). It is in the group of controllers that this anomaly is the most frequent, with 40% of the subjects affected (50/120), whereas approximately 30% of the subjects are affected in the various groups of pilots as well as among the mechanics and navigators. The follow-up carried out for 177 flying personnel in an average period of two and a half years showed the existence of a cardiovascular attack for 12% of the subjects. Therapeutic treatment (diet +/- medication) was effective in 45% of the cases. The decrease in the numbers for cholesterol, the triglycerides, and for a multifactorial risk factor is established at around 10%. Transl. by FLS

N93-32250# Hellenic Air Force Aeromedical Center, Athens (Greece).

LIPIDEMIC PROFILE OF HELLENIC AIRFORCE OFFICERS

J. PALERMOS, A. KITSOU, S. MICHALOPOULOU, and K. KYRIAKOS /in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 4 p Mar. 1993
Copyright Avail: CASI HC A01/MF A03

To gain a better insight into the lipidemic profile of our personnel, the serum concentration of total lipids, total cholesterol, triglycerides, phospholipids, high and low density cholesterol, A-1 and B apolipoproteins were measured chemically in 324 healthy ground officers. Additionally, the LDL cholesterol was estimated using the Friedewald's formula $LDLc = chol - HDLc - (trig/5)$. The population under study, randomly selected, consisted of male, ground officers in active duty serving in the Hellenic Airforce with similar socio-economic status, without any history of coronary heart disease or diabetes mellitus and not receiving any medication. They were grouped into three groups (n = 108) of 31-35, 36-40, and 41-45 years old. A statistically significant increase in the blood concentration of total cholesterol, triglycerides, LDL cholesterol, and apolipoprotein B were found in the 36-40 age group. A significant percentage of individuals in every age group had blood lipid concentrations (cholesterol 41.7 percent, LDL-cholesterol 51.9 percent, triglycerides 7.1 percent, apolipoprotein A-1 43.8 percent) exceeding the desirable levels that prevent an increased risk of a coronary heart disease. Estimated LDLc values were higher than the measured ones, but from regression analysis, stronger relationship between LDLc and total cholesterol was found. No correlation between HDLc and total cholesterol was found. Finally our results suggest that: (1) a high percentage of our ground personnel has blood lipid concentrations (principally chol, LDLc, ap-A1) exceeding the levels that prevent an increased risk of coronary heart disease (CHD); (2) people aged over 40 seem to be sufficiently aware of the risk of high blood lipid concentrations and this awareness has to be extended toward younger ages; (3) certain lipids (phos, HDLc, apo-A1) do not vary among the age groups studied and are possibly not discriminatory markers for the screening of lipidemic profile. Estimated LDLc, though higher than the measured LDLc, showed stronger relationship with total cholesterol and under restrictions can be considered as trustworthy index of the lipidemic profile. Author (revised)

N93-32251# Royal Air Force Central Medical Establishment, London (England).

BLOOD LIPIDS IN AIRCREW RECRUITS AND IN RAF AVIATORS

D. H. HULL /in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 8 p Mar. 1993

Copyright Avail: CASI HC A02/MF A03

Blood cholesterol is a major indicator of cardiovascular risk, mainly from coronary artery disease. Blood lipid elevations are a common cause for referral of RAF aircrew for specialist assessment. The need for investigation, treatment (dietary, drugs), repeated counseling and indefinite follow-up constitutes a significant commitment. Blood lipids were measured in fasting male subjects from two groups; young recruits provisionally accepted for RAF flying training, and trained RAF aircrew. Mean blood cholesterol (SD's) were 4.65 (0.89) mmol/l (180 (34) mgm/dl) in recruits and 5.5 (1.14) mmol/l (213 (44) mgm/dl) in trained aircrew. Corresponding figures for triglycerides were 1.13 (0.56) mmol/l (100 (50) mgm/dl) in recruits and 1.46 (0.86) mmol/l (129 (76) mgm/dl). All differences between groups were significant (p is less than .001). Lipid levels were correlated with age in both groups. Blood lipid levels in recruits were in general satisfactory; the main purpose of measurement remains the detection of the occasional individual with a familial hyperlipidaemia. Blood cholesterol in trained aircrew, though lower than the average for British men, were above desirable limits in 50 percent of all aircrew tested. Ten percent were in the band requiring clinical care and 2 percent might require drug treatment. A program to reduce cardiovascular risk in RAF personnel will include dietary, exercise, and other measures. Author (revised)

N93-32252# Italian Air Force Pratica di Mare, Rome.
CARDIOVASCULAR RISK FACTORS IN AN ITALIAN AIR FORCE POPULATION: PRELIMINARY REPORT

S. FARRACE, L. SAKARA, L. URBANI, and C. DEANGELIS /in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 4 p Mar. 1993
Copyright Avail: CASI HC A01/MF A03

Two hundred male subjects from an Italian Air Force AFB were admitted after informed consent to an epidemiological study on the diffusion of cardiovascular risk factors. They were divided in two groups: group A (n=150; aged 37.7 plus or minus 10.7 yr.) was personnel mainly employed in logistic and administrative activities, group B (n=50; aged 35.2 plus or minus 7.8) were pilots regularly performing flight activity. Each subject underwent a clinical examination, height and weight, resting ECG and blood pressure recording, as well as a 20 ml blood sampling. Measurement of total cholesterol, HDL cholesterol, glucose, uric acid, APO-A, APO-B, and Lp(a) lipoprotein concentration was carried out in each subject. Data showed that while lipid values and mean arterial pressure (MAP) levels are significantly lower in group B (p is less than 0.05) as compared to group A, APO A/B ratio and Lp(a) lipoprotein concentration are significantly higher (p is less than 0.05). These findings may suggest that, despite a lipid profile and mean MAP level within the physiological range and independently from these parameters, it may be recognizable in the pilot group a trend towards atherosclerosis development which needs to be further investigated. Author (revised)

N93-32253# Centro de Instruccion de Medicina Aeroespacial, Madrid (Spain).

CARDIOVASCULAR RISK FACTORS (CVRF) IN SPANISH PILOTS WITH CORONARY ARTERY DISEASE DEMONSTRATED BY ANGIOGRAPHIC STUDIES

M. A. GOMEZ-MARINO, C. ALONSO, and F. RIOS /in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 10 p Mar. 1993

Copyright Avail: CASI HC A02/MF A03

During the years 1987-1991, 32 Spanish pilots with ages between 39 and 56 years (47.34 ± 4.81) had demonstrated coronary obstructive lesions by means of coronary angiography. Each case was studied investigating separately, the following cardiovascular risk factors (CVRF) - cigarette smoking, hypercholesterolemia, hypertriglyceridemia, diabetes, arterial hypertension, obesity, and coronary disease family history. It was found that CVRF were present in all the Spanish pilots with proved coronary artery disease. 87.5 percent were heavy smokers and

68.5 percent had high levels of plasma cholesterol. The smoking habit was the most important single CVRF, even more than cholesterol high levels, but they may be related with the very high number of cigarettes smoked (33.2 ± 11.5 for a period of 24.7 ± 6.3 years). Other CVRF were of little value if not associated to hypercholesterolemia or smoking habit. A proper control of CVRF it should be a priority over the pilot population in order to increase flight safety and the efficiency of the air operations. Author (revised)

N93-32254# German Air Force, Fuerstenfeldbruck (Germany). Aviation Medicine Div.

RESULTS AND MANAGEMENT OF PATHOLOGICAL LIPOPROTEIN CONCENTRATIONS AND OTHER CARDIOVASCULAR RISK FACTORS IN MILITARY PILOTS OF THE GERMAN FEDERAL ARMED FORCES

ERICH ROEDIG /in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 8 p Mar. 1993

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As a result of research findings during the past years, the level and type of circulating lipoprotein concentrations have become a subject of focal interest. It is now well established that high cholesterol levels are related to the extent and severity of arteriosclerotic heart disease. Before this background, the aeromedical physician is called upon to act now, considering the increased psychic and physical demands the new weapon systems will impose on the aviator. In a 4-year survey the lipoprotein concentrations of German military pilots were examined under standardized conditions, the results being evaluated in a statistical program at the German Air Force Institute of Aviation Medicine. Additional risk factors influencing the cardiovascular system are also mentioned. Cholesterol level is greater than 220 mg/dl and HDL cholesterol is less than 35 mg/dl are considered as pathological. This is true in 52.4 percent of German military pilots older than 41 years. In 1992, of all pilots (N=4563) examined, 37.2 percent show cholesterol levels greater than 220 mg/dl while 25.1 percent have a tot. chol./HDL-chol. ratio is greater than 6.0. These results differ from those in the years before. Therefore, besides dietary and physical fitness programs, a regime to reduce pathological lipoprotein concentrations will also be introduced. It is mandatory from an aeromedical point of view that risk factors and disorders of the cardiovascular system be detected by medical flying fitness examination. This particularly applies to silent cardiac ischemia. Author (revised)

N93-32364*# Good Samaritan Hospital and Medical Center, Portland, OR.

TORSIONAL VESTIBULO-OCULAR REFLEX MEASUREMENTS FOR IDENTIFYING OTOLITH ASYMMETRIES POSSIBLY RELATED TO SPACE MOTION SICKNESS SUSCEPTIBILITY

ROBERT J. PETERKA 23 Jul. 1993 8 p Presented at the 10th IAA Man in Space Symposium, Tokyo, Japan, Apr. 1993 (Contract NAG9-117)

(NASA-CR-193304; NAS 1.26:193304) Avail: CASI HC A02/MF A01

Recent studies have identified significant correlations between space motion sickness susceptibility and measures of disconjugate torsional eye movements recorded during parabolic flights. These results support an earlier proposal which hypothesized that an asymmetry of otolith function between the two ears is the cause of space motion sickness. It may be possible to devise experiments that can be performed in the 1 g environment on earth that could identify and quantify the presence of asymmetric otolith function. This paper summarizes the known physiological and anatomical properties of the otolith organs and the properties of the torsional vestibulo-ocular reflex which are relevant to the design of a stimulus to identify otolith asymmetries. A specific stimulus which takes advantage of these properties is proposed. Author (revised)

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A93-46966

THE HUMAN EEG CORRELATES DURING MANY-SIDED PERIPHERAL EXPOSURE TO AN ALTERNATING MAGNETIC FIELD [EHEHG-KORRELYATY CHELOVEKA PRI RAZNOSTORONNEM PERIFERICHESKOM VOZDEJSTVII PEREMENNYM MAGNITNYM POLEM]

I. V. KORINEVSKAYA, YU. A. KHOLODOV, and A. V. KORINEVSKIY (RAN, Inst. Vysshej Nervnoj Deyatel'nosti i Nejrofiziologii; NII Tekhnicheskoi Estetiki, Moscow, Russia) Fiziologiya Cheloveka (ISSN 0131-1646) vol. 19, no. 3 May-June 1993 p. 71-79. In RUSSIAN refs

Copyright

The features of the spatial organization of the human cerebral neocortex during exposure to alternating magnetic field (AMF) were investigated by measuring the EEG characteristics in ten human subjects fitted with ear electrodes with branches over the left and right frontal, central, parietal, and occipital regions of the neocortex and subjected to 50-Hz AMFs for 1 min. Results showed that the subjects could be classified into three groups, depending on their sensitivity to AMFs, which are characterized by different structures of the cross-correlation links in the investigated neocortex regions and by the characteristics of interactions between the hemispheres. AIAA

N93-31729 Civil Aviation Authority, London (England).

MANDATORY MULTI-ENGINEED TRAINING SYLLABUS

Jun. 1992 32 p

(CAP-601; ISBN-0-86-039518-9; ETN-93-93931) Copyright

Avail: Issuing Activity (Civil Aviation Authority, Greville House, 37 Gratton Road, Cheltenham, England, HC)

A training syllabus produced by the United Kingdom Civil Aviation Authority for use by all flying training organizations wishing to conduct the mandatory course for multiengineed flying training is presented. The flight and ground training are detailed. The course aims to give a sound theoretical knowledge of multiengineed aircraft operation and to teach the skills necessary for the safe and competent operation of such aircraft. An abridged turbojet course is also described. ESA

N93-32011# Battelle Columbus Labs., Research Triangle Park, NC.

SELECTION OF PERSONNEL FOR STRESSFUL OCCUPATIONS: THE POTENTIAL UTILITY OF PSYCHOPHYSIOLOGICAL MEASURES AS SELECTION TOOLS Final Report, Aug. 1991 - Nov. 1992

RONALD J. HESLEGRAVE and CARAN COLVIN Mar. 1993 70 p

(Contract DAAL03-86-D-0001; DA PROJ. 2Q2-63007-A-792)

(AD-A264571; ARI-TR-975) Avail: CASI HC A04/MF A01

The Manpower and Personnel Research Division identified a requirement to assess whether selection and classification for stressful occupations could be improved. An interdisciplinary review, evaluation, and synthesis was carried out to assess the feasibility of using psychophysiological measures to select individuals resistant to stress to improve selection and classification methods for stressful occupations. To integrate this literature, a new psychophysiological model was developed in the context of current industrial/organizational practice. Researchers concluded that psychophysiological measures do have the potential to improve the selection/classification standards for stressful occupations. Three recommendations were made for future research. First, experimentation should begin to assess the validity of the proposed psychophysiological measures to predict successful performance under stress. Second, since people who cope successfully appear

to share some personality traits, research should be conducted into the personality correlates of successful task performance under stress. Third, occupations should be analyzed in terms of stress dimensions to provide a rationale for the identification of valid predictors and criteria of successful performance in stressful jobs. A demonstration study was outlined. DTIC

N93-32064# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.

CONNECTIONIST MODELS AND LINGUISTIC THEORY: INVESTIGATIONS OF STRESS SYSTEMS IN LANGUAGE

PRAHLAD GUPTA and DAVID S. TOURETZKY Apr. 1993 34 p

(Contract N00014-86-K-0678)

(AD-A265450; CMU-CS-93-146) Avail: CASI HC A03/MF A01

We question the widespread assumption that linguistic theory should guide the formulation of mechanistic accounts of human language processing. We develop a pseudo-linguistic theory for the domain of linguistic stress, based on observation of the learning behavior of a perceptron exposed to a variety of stress patterns. There are significant similarities between our analysis of perceptron stress learning and metrical phonology, the linguistic theory of human stress. Both approaches attempt to identify salient characteristics of the stress systems under examination without reference to the workings of the underlying processor. Our theory and computer simulations exhibit some strikingly suggestive correspondences with metrical theory. We show, however, that our high-level pseudo-linguistic account bears no causal relation to processing in the perceptron, and provides little insight into the nature of this processing. Because of the persuasive similarities between the nature of our theory and linguistic theorizing, we suggest that linguistic theory may be in much the same position.

DTIC

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A93-45598* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

KINEMATICS AND CONTROL OF A FULLY PARALLEL FORCE-REFLECTING HAND CONTROLLER FOR MANIPULATOR TELEOPERATION

MARK D. BRYFOGLE (Science Applications International Corp., McLean, VA), CHARLES C. NGUYEN, SAMI S. ANTRAZI, and PETER C. CHIOU (Catholic Univ. of America, Washington) Journal of Robotic Systems (ISSN 0741-2223) vol. 10, no. 5 July 1993 p. 745-766. refs

(Contract NAS7-1069)

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Design of a parallel force-reflecting hand controller that implements a friction- and inertia canceling control loop about the entire mechanism based on wrench sensing in the mechanism handgrip is discussed. Kinematics of the controller under consideration is analyzed and results are presented using a closed-form solution for the inverse kinematics and Newton-Raphson's method for the forward kinematics. Results indicate that the force control scheme based on a handgrip force sensor provides smaller steady-state errors than the scheme without a handgrip sensor. AIAA

A93-45685

A PROCEDURE FOR ESTIMATING THE VARIABLES OF THE WORKING-CONDITION SPACE OF A MAN-MACHINE SYSTEM FOR THE CONTROL OF A MOVING OBJECT (PROTSEDURA OTSENIVANIYA PEREMENNYKH PROSTRANSTVA PROFESSIONAL'NOGO SOSTOYANIYA EHRGATICHESKOJ SISTEMY UPRAVLENIYA PODVIZHNYM OB'EKТОМ)

A. A. BEZBOGOV and V. I. AVAKOV (Rizhskoe Vysshee Aviatsonnoe Inzhenernoe Uchilishche, Riga, Latvia) Kibernetika i Vychislitel'naya Tekhnika (ISSN 0454-9910) no. 96 1992 p. 33-36. In RUSSIAN refs

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The concept of the working-condition space is defined as a set of operator's subjective notions concerning the dynamic properties of the controlled system. A procedure is developed for estimating variables of the working-condition space, and its application is illustrated using example where a pilot has to change the angular position of the aircraft. AIAA

A93-45687

DISTRIBUTION OF FUNCTIONS IN A MAN-MACHINE CONTROL SYSTEM OF A CERTAIN TYPE (RASPREDELENIYE FUNKTSIJ V EHRGATICHESKOJ SISTEME UPRAVLENIYA ODNOGO KLASSA)

A. E. RADIEVSKIY (NPO Kievskij Inst. Avtomatiki, Kiev, Ukraine) Kibernetika i Vychislitel'naya Tekhnika (ISSN 0454-9910) no. 96 1992 p. 53-58. In RUSSIAN refs

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The paper investigates the theoretical principles of a procedure for the efficient distribution of functions between the automatic facilities of an aircraft control system and the manual activity of the operator. It is shown that the procedure must combine the following conditions: (1) continuous participation of the operator in the control process in the support and interactive modes and (2) unified control logic, realized by a smooth transition between automatic and manual control regimes. The paper presents a mathematical formulation and an analysis of the problem. AIAA

A93-45688

A METHOD FOR PREDICTING THE WORK LOAD OF A FLIGHT ENGINEER ENGAGED IN COUNTERACTING FAILURES OF FUNCTIONAL SYSTEMS OF A TRANSPORT AIRCRAFT (METODIKA PROGNOZIROVANIYA RABOCHEJ NAGRUZKI BORTINZHENERA PRI PARIROVANII OTKAZOV FUNKSIONAL'NYKH SISTEM TRANSPORTNOGO SAMOLETA)

A. A. TERESHKIN Kibernetika i Vychislitel'naya Tekhnika (ISSN 0454-9910) no. 96 1992 p. 83-90. In RUSSIAN refs

Copyright

The paper presents a formulation of a systems-engineering criterion of the efficiency and reliability of the flight engineer's activity. The criterion depends on the correspondence between the parameters of the real-life activity and the standard specifications, and takes into account the potential danger of deviations from the standard procedures for the crew-aircraft system as a whole. The paper proposes a correlation-factor model of a flight engineer engaged in counteracting the failures of the aircraft's functional system. Mathematical models are developed for predicting the work load of the flight engineer and the time for the completion of the prescribed activity. AIAA

A93-46901

AN ON-LINE WATER QUALITY MONITOR FOR SPACE STATION FREEDOM

E. L. JEFFERS, D. R. DOUGHERTY, T. A. PAXTON (Astro International Corp., League City, TX), and J. E. ATWATER (Umpqua Research Co., Myrtle Creek, OR) Mar. 1993 31 p. AICHE, Spring National Meeting on Development Needs for Spacecraft Advanced Life Support Systems, Houston, TX, Mar. 30, 1993, Paper refs

Water is recycled on Space Station Freedom (SSF) to avoid the high logistical cost of fresh water resupply. The water system produces potable water from humidity condensate, wash water,

fuel cell water transferred from the shuttle, and urine. The processes include vapor compression distillation of urine, heat sterilization, sorption beds, organics oxidation, gas-liquid separation, filtration, and biocide addition. Treated water quality is monitored by a Process Control Water Quality Monitor (PCWQM), which reports water quality to the SSF data management system. Specifically, the PCWQM is an untended, continuous process water quality monitor which measures conductivity, pH, Total Organic Carbon (TOC), temperature, and iodine biocide concentration. TOC is measured by converting organic carbon into CO₂ by UV oxidation and using a photometric cell to determine the quantity of gas. Conductivity is measured using a 1000 Hz conductivity cell compensated for temperature. Iodine is measured using a solid state, LED-based photometric cell, compensated for pH. Temperature is measured directly using an integrated circuit sensor (AD590) mounted in a thermal well. pH is measured using an ISFET, calibrated using solid phase standards. The analytical methodology, hardware description, and results of testing simulated spacecraft water are presented.

A93-46810* National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

THE EFFECTS OF HISTORY AND PREDICTIVE INFORMATION ON THE ABILITY OF THE TRANSPORT AIRCRAFT PILOT TO PREDICT AN ALERT

ANNA C. TRUJILLO (NASA, Langley Research Center, Hampton, VA) Feb. 1993 8 p. Mid-Atlantic Human Factors Conference, 1st, Virginia Beach, VA, Feb. 25, 26, 1993, Paper - refs Copyright

The early detection of a developing aircraft-subsystem fault has the potential to lessen its ultimate severity. The lack of capability for such early detection is becoming critical in the aviation community. In the commercial sector, for example, twin-engine aircraft are being used for extended transport operations over water. One method to decrease the severity of a developing problem is to predict its behavior and to take appropriate corrective action. In order to investigate pilots' ability to predict events, an experiment was conducted where eighteen airline pilots predicted the time to an alert using three different displays of dials and three different time profile complexities. The three displays of dials were as follows: standard, resembling current air traffic dial presentations; history, indicating the value five seconds in the past; and predictive, indicating the value five seconds into the future. The time profiles describing the behavior of the parameter consisted of constant velocity profiles, decelerating profiles, and accelerating then decelerating profiles. Although pilots indicated that they preferred the predictive dial, the objective data did not support its use. The objective data did show that the time profiles had the most significant effect on performance in estimating the time to an alert.

A93-47019

FLIGHT MECHANICS OF HIGH-PERFORMANCE AIRCRAFT

NGUYEN X. VINH (Michigan Univ., Ann Arbor) Cambridge, United Kingdom and New York Cambridge University Press (Cambridge Aerospace Series, No. 4) 1993 394 p. refs (ISBN 0-521-34123-X) Copyright

The present treatment of military aircraft flight mechanics discusses the equations of motion, propulsion system fundamentals, descent and glide performance, performance in cruising flight, climb, and turning flight, takeoff and landing performance characteristics, and the performance of hypervelocity reentry vehicles. For high performance aircraft, the influence of Mach number at high subsonic and supersonic speeds becomes a major consideration; the concept of 'energy height' is explored. All exercises included are analytical to deepen understanding of the text. AIAA

N93-31456* McDonnell-Douglas Space Systems Co., Huntington Beach, CA.

ATMOSPHERIC CONTROL SYSTEMS

MELANIE MANKAMYER *In its Workshop on Fuzzy Control*

Systems and Space Station Applications p 419-425 Nov. 1990
Avail: CASI HC A02/MF A04

Viewgraphs on atmospheric control systems are presented. Techniques to maintain atmospheric control parameters are identified. Fuzzy logic control law is mentioned for application to atmospheric control. CASI

N93-31457* McDonnell-Douglas Space Systems Co., Huntington Beach, CA.

ROTATIONAL SPEED CONTROL

PAUL BASTIN *In its Workshop on Fuzzy Control Systems and Space Station Applications* p 427-434 Nov. 1990
Avail: CASI HC A02/MF A04

Viewgraphs on rotational speed control are presented. The Centrifuge Facility Systems Study - 2.5 m centrifuge is shown. A life sciences centrifuge is scheduled to fly aboard Space Station Freedom. Live animal and plant specimens will be carried on the rotor and compared with microgravity specimens in racks. CASI

N93-31458* McDonnell-Douglas Space Systems Co., Huntington Beach, CA.

VIBRATION ISOLATION

PAUL BASTIN *In its Workshop on Fuzzy Control Systems and Space Station Applications* p 435-443 Nov. 1990
Avail: CASI HC A02/MF A04

Viewgraphs on vibration isolation are presented. Techniques to control and isolate centrifuge disturbances were identified. Topics covered include: disturbance sources in the microgravity environment; microgravity assessment criteria; life sciences centrifuge; flight support equipment for launch; active vibration isolation system; active balancing system; and fuzzy logic control. CASI

N93-31573* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

PROBABILISTIC SIMULATION OF THE HUMAN FACTOR IN STRUCTURAL RELIABILITY

ASHWIN R. SHAH (Sverdrup Technology, Inc., Brook Park, OH.) and CHRISTOS C. CHAMIS *In its Structural Integrity and Durability of Reusable Space Propulsion Systems* p 159-168 May 1991
Avail: CASI HC A02/MF A03

Many structural failures have occasionally been attributed to human factors in engineering design, analyses maintenance, and fabrication processes. Every facet of the engineering process is heavily governed by human factors and the degree of uncertainty associated with them. Factors such as societal, physical, professional, psychological, and many others introduce uncertainties that significantly influence the reliability of human performance. Quantifying human factors and associated uncertainties in structural reliability require: (1) identification of the fundamental factors that influence human performance, and (2) models to describe the interaction of these factors. An approach is being developed to quantify the uncertainties associated with the human performance. This approach consists of a multi factor model in conjunction with direct Monte-Carlo simulation.

Derived from text

N93-31844* Wyoming Univ., Laramie. Dept. of Computer Science.

A VISION SYSTEM PLANNER FOR INCREASING THE AUTONOMY OF THE EXTRAVEHICULAR ACTIVITY HELPER/RETRIEVER

MICHAEL MAGEE 1 Jun. 1993 54 p
(Contract NAG9-634)

(NASA-CR-193301; NAS 1.26:193301) Avail: CASI HC A04/MF A01

The Extravehicular Activity Retriever (EVAR) is a robotic device currently being developed by the Automation and Robotics Division at the NASA Johnson Space Center to support activities in the neighborhood of the Space Shuttle or Space Station Freedom. As the name implies, the Retriever's primary function will be to provide the capability to retrieve tools and equipment or other objects which have become detached from the spacecraft, but it

will also be able to rescue a crew member who may have become inadvertently de-tethered. Later goals will include cooperative operations between a crew member and the Retriever such as fetching a tool that is required for servicing or maintenance operations. This paper documents a preliminary design for a Vision System Planner (VSP) for the EVAR that is capable of achieving visual objectives provided to it by a high level task planner. Typical commands which the task planner might issue to the VSP relate to object recognition, object location determination, and obstacle detection. Upon receiving a command from the task planner, the VSP then plans a sequence of actions to achieve the specified objective using a model-based reasoning approach. This sequence may involve choosing an appropriate sensor, selecting an algorithm to process the data, reorienting the sensor, adjusting the effective resolution of the image using lens zooming capability, and/or requesting the task planner to reposition the EVAR to obtain a different view of the object. An initial version of the Vision System Planner which realizes the above capabilities using simulated images has been implemented and tested. The remaining sections describe the architecture and capabilities of the VSP and its relationship to the high level task planner. In addition, typical plans that are generated to achieve visual goals for various scenarios are discussed. Specific topics to be addressed will include object search strategies, repositioning of the EVAR to improve the quality of information obtained from the sensors, and complementary usage of the sensors and redundant capabilities. Author

N93-32006# Naval Air Warfare Center, Patuxent River, MD. Aircraft Div.

ABRIDGED PROCEDURAL GUIDE TO AIRCREW ANTHROPOMETRIC ACCOMMODATION ASSESSMENT

SCOTT A. PRICE 14 Apr. 1993 69 p
(AD-A265220; NAWCADPAX-TM-992-90-SY) Avail: CASI HC A04/MF A01

NAVAIRSYSCOM (AIR-531) tasked us to investigate and develop new procedures for determining the ranges and limitations of anthropometric accommodation in military aircraft. These procedures quantify what types of aircrew, based on their body's morphologies, are able to safely and efficiently operate a particular crewstation in an operational environment. Aircrew Anthropometric Accommodation Assessment provides detailed, repeatable methods for obtaining the accommodation data needed to determine this. Results are plotted to determine the full range of anthropometric values and their relationship to pilot/aircrew 'fit' for a number of important areas. Use of Aircrew Anthropometric Accommodation Assessment enables the establishment of Anthropometric Restriction Codes, reduces the need for fit-checks, guides student naval aviators into appropriate pipelines, determines contractor compliance with design goals, and identifies deficiencies in the crewstation layout of mockups and aircraft undergoing development. DTIC

N93-32012# Analytics, Inc., Willow Grove, PA.
APPLICATION AND VALIDATION OF WORKLOAD ASSESSMENT TECHNIQUES Final Report, Sep. 1986 - Sep. 1992

RICHARD E. CHRIST, SUSAN G. HILL, JAMES C. BYERS, HELENE M. LAVECCHIA, and ALLEN L. ZAKLAD Mar. 1993 157 p

(Contract MDA903-86-C-0384; DA PROJ. 2Q1-62785-A-790)
(AD-A264575; ARI-TR-974) Avail: CASI HC A08/MF A02

A series of eight separate studies was conducted using three different Army systems. These studies applied both empirical methods for evaluating the workload associated with the operation of Army systems and analytical methods for predicting that workload. The empirical methods examined were variants of four operator rating scale techniques. The analytical methods scale techniques and a task analysis and simulation technique. The three systems studied included a mobile air defense missile system, a remotely piloted air vehicle system, and a helicopter system. DTIC

N93-32106*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MAN-MACHINE COOPERATION IN ADVANCED TELEOPERATION

PAOLO FIORINI, HARI DAS, and SUKHAN LEE In NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) p 87-93 Feb. 1993

Avail: CASI HC A02/MF A04

Teleoperation experiments at JPL have shown that advanced features in a telerobotic system are a necessary condition for good results, but that they are not sufficient to assure consistently good performance by the operators. Two or three operators are normally used during training and experiments to maintain the desired performance. An alternative to this multi-operator control station is a man-machine interface embedding computer programs that can perform some of the operator's functions. In this paper we present our first experiments with these concepts, in which we focused on the areas of real-time task monitoring and interactive path planning. In the first case, when performing a known task, the operator has an automatic aid for setting control parameters and camera views. In the second case, an interactive path planner will rank different path alternatives so that the operator will make the correct control decision. The monitoring function has been implemented with a neural network doing the real-time task segmentation. The interactive path planner was implemented for redundant manipulators to specify arm configurations across the desired path and satisfy geometric, task, and performance constraints. Author (revised)

N93-32107*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

INTEGRATION OF ADVANCED TELEOPERATION TECHNOLOGIES FOR CONTROL OF SPACE ROBOTS

MICHAEL J. STAGNARO In its The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) p 94-103 Feb. 1993

Avail: CASI HC A02/MF A04

Teleoperated robots require one or more humans to control actuators, mechanisms, and other robot equipment given feedback from onboard sensors. To accomplish this task, the human or humans require some form of control station. Desirable features of such a control station include operation by a single human, comfort, and natural human interfaces (visual, audio, motion, tactile, etc.). These interfaces should work to maximize performance of the human/robot system by streamlining the link between human brain and robot equipment. This paper describes development of a control station testbed with the characteristics described above. Initially, this testbed will be used to control two teleoperated robots. Features of the robots include anthropomorphic mechanisms, slaving to the testbed, and delivery of sensory feedback to the testbed. The testbed will make use of technologies such as helmet mounted displays, voice recognition, and exoskeleton masters. It will allow for integration and testing of emerging telepresence technologies along with techniques for coping with control link time delays. Systems developed from this testbed could be applied to ground control of space based robots. During man-tended operations, the Space Station Freedom may benefit from ground control of IVA or EVA robots with science or maintenance tasks. Planetary exploration may also find advanced teleoperation systems to be very useful. Author (revised)

N93-32108*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

INTERACTIVE AND COOPERATIVE SENSING AND CONTROL FOR ADVANCED TELEOPERATION

SUKHAN LEE In NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) p 104-115 Feb. 1993

Avail: CASI HC A03/MF A04

This paper presents the paradigm of interactive and cooperative sensing and control as a fundamental mechanism of integrating and fusing the strengths of man and machine for advanced

teleoperation. The interactive and cooperative sensing and control is considered as an extended and generalized form of traded and shared control. The emphasis of interactive and cooperative sensing and control is given to the distribution of mutually nonexclusive subtasks to man and machine, the interactive invocation of subtasks under the man/machine symbiotic relationship, and the fusion of information and decisionmaking between man and machine according to their confidence measures. The proposed interactive and cooperative sensing and control system is composed of such major functional blocks as the logical sensor system, the sensor-based local autonomy, the virtual environment formation, and the cooperative decision-making between man and machine. The Sensing-Knowledge-Command (SKC) fusion network is proposed as a fundamental architecture for implementing cooperative and interactive sensing and control. Simulation results are shown. Author

N93-32112* Naval Command, Control and Ocean Surveillance Center, Kailua, HI.

TELEOPERATOR/TELEPRESENCE SYSTEM (TOPS) CONCEPT VERIFICATION MODEL (CVM) DEVELOPMENT

MIKE S. SHIMAMOTO *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) p 149-155 Feb. 1993. Avail: CASI HC A02/MF A04

The development of an anthropomorphic, undersea manipulator system, the TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) is described. The TOPS system's design philosophy, which results from NRC's experience in undersea vehicles and manipulator systems development and operations, is presented. The TOPS design approach, task teams, manipulator, and vision system development and results, conclusions, and recommendations are presented. Author (revised)

N93-32151* Air Force Systems Command, Brooks AFB, TX.
A PRELIMINARY EMPIRICAL EVALUATION OF VIRTUAL REALITY AS AN INSTRUCTIONAL MEDIUM FOR VISUAL-SPATIAL TASKS Abstract only

J. WESLEY REGAN, WAYNE SHEBILSKIE, and JOHN M. MONK (Galaxy Scientific Corp., Lackland AFB, TX.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) p 406 Feb. 1993

Avail: CASI HC A01/MF A04

We explored the training potential of Virtual Reality (VR) technology. Thirty-one adults were trained and tested on spatial skills in a VR. They learned a sequence of button and knob responses on a VR console and performed flawlessly on the same console. Half were trained with a rote strategy; the rest used a meaningful strategy. Response times were equivalent for both groups and decreased significantly over five test trials indicating that learning continued on VR tests. The same subjects practiced navigating through a VR building, which had three floors with four rooms on each floor. The dependent measure was the number of rooms traversed on routes that differed from training routes. Many subjects completed tests in the fewest rooms possible. All subjects learned configurational knowledge according to the criterion of taking paths that were significantly shorter than those predicted by a random walk as determined by a Monte Carlo analysis. The results were discussed as a departure point for empirically testing the training potential of VR technology. Author

N93-32152* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

A DECISION-THEORETIC APPROACH TO THE DISPLAY OF INFORMATION FOR TIME-CRITICAL DECISIONS: THE VISTA PROJECT

ERIC HORVITZ (Rockwell International Science Center, Palo Alto, CA.), CORINNE RUOKANGAS (Rockwell International Science Center, Palo Alto, CA.), SAMPATH SRINIVAS (Rockwell International Science Center, Palo Alto, CA.), and MATTHEW BARRY *In* The Sixth Annual Workshop on Space Operations

Applications and Research (SOAR 1992) p 407-417 Feb. 1993. Avail: CASI HC A03/MF A04

We describe a collaborative research and development effort between the Palo Alto Laboratory of the Rockwell Science Center, Rockwell Space Operations Company, and the Propulsion Systems Section of NASA JSC to design computational tools that can manage the complexity of information displayed to human operators in high-stakes, time-critical decision contexts. We shall review an application from NASA Mission Control and describe how we integrated a probabilistic diagnostic model and a time-dependent utility model, with techniques for managing the complexity of computer displays. Then, we shall describe the behavior of VPROP, a system constructed to demonstrate promising display-management techniques. Finally, we shall describe our current research directions on the Vista 2 follow-on project.

Author (revised)

N93-32240* Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.

NUTRITION, METABOLIC DISORDERS AND LIFESTYLE OF AIRCREW (LES DESORDRES METABOLIQUES DUS A LA DIETETIQUE ET HYGIENE DE VIE DES EQUIPAGES D'AERONEFS)

Mar. 1993 230 p Symposium held in Oslo, Norway, 19-23 Oct. 1992

(AGARD-CP-533; ISBN-92-835-0703-7) Copyright Avail: CASI HC A11/MF A03

These proceedings include the Technical Evaluation Report and 30 papers of the symposium sponsored by the AGARD Aerospace Medical Panel and held in Oslo, Norway from 19-23 Oct. 1992. The theme of the symposium was to review and update the knowledge pertaining to diet and nutrition as it applies to aircrew. The metabolic disorders, including hyperlipidemia and alterations of carbohydrate metabolism, are common problems in aviation medicine that demand specific attention and management by NATO flight surgeons. Hyperlipidemia is a cardiovascular risk factor that by itself or when combined with cigarette smoking and sedentary behavior as well as other risk factors presents a formidable problem for all NATO Air Forces as this directly impacts on pilot performance. Performance may also be affected by inadequate crew rest, environmental extremes and time zone shifts, all of which were illustrated in the Persian Gulf Conflict.

N93-32241* Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Delft (Netherlands). Dept. of Human Nutrition.

AN AUTOMATED PROCESSING SYSTEM FOR FOOD FREQUENCY AND NUTRITION KNOWLEDGE QUESTIONNAIRE

A VANERP-BAART, M. J., I. C. KISTEMAKER, and M. R. H. LOEWIK *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 3 p Mar. 1993

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In surveys and intervention studies, food frequency questionnaires are often used to assess habitual dietary intake. Although this is a relatively quick and simple method, the number of subjects to be examined can still be enormous. So, without a good system, the time needed for the processing of the amount of data may be prohibitive for starting such a project. To structure and speed up this work, FOFRIPS, a food frequency interactive processing system was developed. The starting point was that not each developed specific questionnaire should be automated, but instead only the general procedures of the data processing.

Author (revised)

N93-32242* University of South Florida, Tampa. Coll. of Public Health.

NUTRITIONAL ASSESSMENT OF UNITED STATES TACTICAL AIR COMMAND PILOTS

S. D. HART YEVICH, S. J. YEVICH, and C. MORRISON *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 5 p Mar. 1993

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The nutritional status of 184 TAC fighter pilots was analyzed for caloric intake, macronutrient composition, alcohol intake, and meal frequency. The dietary habits of fighter pilots relative to their age, family configuration, and level of exercise were also examined. The diets of a sub-group of 43 F-16 student fighter pilots were correlated with the subjective graded performance of a Basic Fighter Maneuver. Pilots energy consumption of 2800 kcal fell within the suggested range for the average U.S. male. The macronutrient composition of their diets was better than that of the mean U.S. male, comprising an average of 46% carbohydrates, 34% fats, 15% protein, and 5% alcohol. Missed meals on the day of flying were a frequent occurrence. The older age pilots consumed less fat than their younger counterparts, but their intake of alcohol was greater. Family configuration had no effect on alcohol consumption, caloric intake, or dietary behavior. Pilots who exercised 4 to 7 day a week were heavier than the non-exercisers, and the non-exercisers consumed more alcohol. No statistical difference could be found between total performance scores in the sub-group of F-16 student pilots and any deficiency or excess of specific dietary components or any combinations of these components. Alcohol consumption was shown to be associated with a low G-tolerance score. Author

N93-32243# Oslo Univ. (Norway). Inst. for Nutrition Research.
PORTABLE EQUIPMENT DEVELOPED TO ESTIMATE ENERGY EXPENDITURE BY SIMULTANEOUS RECORDING OF HEART RATE AND BODY POSITION

A. LOVO, B. E. HUSTVEDT, A. CHRISTOPHERSEN, C. C. CHRISTENSEN (Royal Norwegian Air Force, Oslo.), and H. T. ANDERSEN (Royal Norwegian Air Force, Oslo.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 5 p Mar. 1993

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The operating principle of Actireg, a new device for registration of changes in human body positions, is described. It is robust and functions well also during prolonged periods of high physical activity, in contrast to accelerometers and other devices used as motion sensors. Preliminary experiments indicate that combined use of heart rate and body position recording for estimation of energy expenditure may be superior to the use of heart rate registrations alone. However, validation experiments with doubly labeled water or a whole body calorimeter are needed in order to reach a firm conclusion on this point. Author

N93-32244# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Bretigny sur Orge (France). Div. de Physiologie Metabolique et Hormonale.

PROTEIN REQUIREMENTS IN HYPOXIA OR HYPOKINESIA
C. Y. GUEZENNEC, A. X. BIGARD, and D. TAILLANDIER *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 5 p Mar. 1993

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Muscle trophicity is under the influence of four major factors which are nutrition, nervous stimulation, muscle activity, and hormones. Numerous works have shown that substrate availability acts directly on muscle protein synthesis. The glucidic and proteic substrates regulate in a coordinated way the muscle proteosynthesis so that the attention was focused on the role of protein nutriment to protect muscle against protein wasting. Several conditions could decrease protein body stores among which are hypoxia exposure or hypokinesia. Both environmental factors are results of aerospace or military events. Two studies were conducted in order to evaluate the role of protein diet on protein metabolism during hypokinesia or hypoxia exposure. Author

N93-32245# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

NUTRITION FOR A TYPICAL MAC CREW DURING DESERT STORM

J. FRENCH and T. J. COOK *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 6 p Mar. 1993

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Data on inflight meals were collected during a 30-day field

experiment conducted by the Armstrong Laboratory designed to evaluate fatigue in C-141 Military Airlift Command (MAC) aircrew. Flight meal information was collected for one five-member crew throughout the area of operation during the last week of Desert Storm and for 3 additional weeks. Focus is on the nutritional components of a representative sample of the inflight meals provided to MAC aircrew. Nutritional analysis was based on fifteen inflight meals obtained from various Desert Storm staging bases. Analysis concerned kilocalories, protein, carbohydrate, fat, cholesterol, sodium, and saturated fats present in the average meal. The mean value for these components, constituting an average inflight meal, were 1758 Kcal, 53 g protein, 233 g carbohydrate, 66 g fat, 136 mg cholesterol, 3240 mg sodium and 20 g saturated fats. The limitations of this opportunistic evaluation and the need for additional field analyses of inflight meals and aircrew diets is discussed. Author

N93-32246# Institute of Aviation Medicine, Oslo (Norway).
CHANGES IN FOOD AND ENERGY INTAKE IN MILITARY AIRCREW

C. HELLE, K. KVAMSOE, K. TRYGG, and H. T. ANDERSEN *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 7 p Mar. 1993

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Military flying is a demanding profession requiring excellent performance during operations. Because the modern western society includes several undesirable lifestyle patterns, dietary counseling has been given increased attention over the past few years in Norway where the government has arrived at an official policy of nutritional standards. In order to provide information about the nutritional pattern of military aircrew, the Institute of Aviation Medicine (IAM) carried out a food survey on aircrew at Andoya Air Base in 1986. The present survey is a follow-up study of the 1986 study, using the same squadron and the same method as the previous study. Our survey has three aims. The first one is to detect any change in aircrew diet over the last six years. Secondly, since the 1986 survey showed that the aircrew took a nutritionally better diet than the average Norwegian population, it was investigated whether this group is still ahead. Finally, to what extent the irregular working and resting conditions of aircrew influence their meal schedule was studied. Author (revised)

N93-32247# Spanish Air Force, Talavera AFB.
TRIAL OF EMERGENCY RATION OF THE SPANISH AIR FORCE

ANTONIO MENDEZ MARTIN and JOSE IGNACIO PERALBA VANO *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 6 p Mar. 1993

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The response of normal young volunteers to the Spanish Air Force (SAF) Emergency Rations (ER) (NATO code 8.970-33G02-0140) as the only nutriment during seven consecutive days was tested. The nutritional and metabolic response plus the psychological acceptability of the ER was evaluated. All the volunteers were medical students who were fully informed about the trial and its conditions. Each proband received a daily diet with only ER (1,000 Kcal/day, 10 chewable bars/210 grms total weight) equivalent to 580 Kcal/sqmeter/body surface/day with two optional flavors, orange or chocolate. Quantity of liquids per day/probands was from 1.5 to 2.0 liters. Probands carry out their normal daily activity without changes in usual timing except meals. The trial duration was 7 days. The conclusion was that the SAF ER provides satisfactory nutrition for short periods of time without impairing the daily activities or altering the metabolic and nutritional parameters in a normal young population. Author (revised)

N93-32248# Italian Air Force Pratica di Mare, Rome.
IDIOPATHIC REACTIVE HYPOGLYCEMIA IN A POPULATION OF HEALTHY TRAINEES OF AN ITALIAN AIR FORCE MILITARY SCHOOL

STEFANO FARRACE, LUCA URBANI, LORENZO SAKARA, and CLAUDIO DEANGELIS *In* AGARD, Nutrition, Metabolic Disorders

and Lifestyle of Aircrew 3 p Mar. 1993
Copyright Avail: CASI HC A01/MF A03

Idiopathic Reactive Hypoglycemia (IRH) was investigated among a population of young trainees of an Italian Air Force military school. One hundred and twenty male healthy subjects underwent a 300 min Oral Glucose Tolerance Test (OGTT) after an overnight fasting. Nine out of 120 subjects (group A: 7.5 percent) showed a glycemia nadir below 50 mg/dl. Moreover, in group A eight out of nine subjects reported symptoms referable to clinical hypoglycemia during the glycemia nadir. Furthermore, a lack in glucagon response to hypoglycemia was observed in group A. Data are suggestive for the presence of Idiopathic Reactive Hypoglycemia in group A subjects. Data suggest that IRH may be considered relevant as a possible reason of in-flight accident due to human factor.

Author (revised)

N93-32255# Portuguese Air Force, Alfragide. Centro de Medicina Aeronautica.

NUTRITIONAL AND LIFESTYLE STATUS OF 50 PILOTS OF THE PORTUGUESE AIR FORCE

F. B. OLIVEIRA, N. L. RIBEIRO, and S. R. SILVEIRA in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 2 p Mar. 1993

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A group of 50 pilots selected from a non-academic pilot background, born between 1947-1960, had their body weight, smoking and drinking habits, and blood pressure evaluated during a 10 year survey. Fifty six percent had Real Body Weight (F5W) greater than the Ideal Body Weight (IBW), with a 28 percent of RBW greater than + 10Kg of the IBW. Smoking habits were over 20 cigarettes per day in 36 percent and only 10 percent didn't smoke. Declared alcoholic intake, over average consumption, was admitted in 14 percent, with 3 alcoholic psychiatric treatment and 1 admission to hospital with Acute Alc. Hepatitis. Blood pressure was over normal range in 12 percent. A modified clinical and Laboratorial screening is being applied, since 1991.

Author (revised)

N93-32256# Hellenic Air Force General Hospital, Athens (Greece).

CORRELATION OF LIFE-STYLE AND DIETARY CONCOMITANTS OF GREEK PILOTS WITH SERUM ANALYTES

C. DASKALOPOULOS, J. PALERMOS, T. ZOGA, A. STAVROPOULOS, and K. KYRIAKOS in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 4 p Mar. 1993
Copyright Avail: CASI HC A01/MF A03

Certain serum analytes (glucose, total cholesterol, HDL cholesterol, triglycerides, uric acid, and γ -glutamyltransferase) were correlated with some lifestyle variables (dietary features, anthropometrics, and physical exercise) in military ($n=157$) and civilian ($n=157$) male pilots in order to determine a possible relationship between these variables and their health status. The subjects, randomly selected within a certain period, were currently active without any history of coronary heart disease or diabetes mellitus and were not receiving any medication. In total, military pilots had statistically significant increased mean values of glucose, while a correlation of the mean values between groups with similar age showed that military pilots had increased cholesterol values and civilian pilots had increased triglycerides, LDL cholesterol, and γ -GT values. Both had an average body mass index (weight/height(sup 2)) of 25 and very few of them were following an effective physical exercise program toward lowering cholesterol level. They preferred taking few (82.1 percent, 80.9 percent for military and civilian pilots respectively) but large meals (59.2 percent, 52.2 percent respectively). Concerning food composition, almost 30 percent of them were eating meals containing 38 percent or more fat, and 15 percent of them were eating meals with less than 44 percent carbohydrates of total daily caloric intake. Finally, our data suggest that: (1) the concentration of certain blood analytes (glucose, cholesterol) should be reduced, (2) an effective regular aerobic exercise program should be followed, and (3) meals

should be altered toward the pattern of 'many and small' per day containing less fat and more carbohydrates. Author (revised)

N93-32257# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

THE LIFESTYLE AND DIETARY CONSUMPTION PATTERNS OF UNITED STATES AIR FORCE AVIATORS WITHIN AIR TRAINING COMMAND AT RANDOLPH AIR FORCE BASE, TEXAS

TAMMY J. COOK, JONATHAN FRENCH, and BETH SENNE-DUFF (Incarinate Word Coll., San Antonio, TX.) in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 8 p Mar. 1993
Copyright Avail: CASI HC A02/MF A03

A lifestyle survey was developed and distributed to two flying squadrons and to the rated officers of the 12th Flying Training Wing to examine lifestyle habits and dietary consumption patterns. Blood lipid profiles were gathered and classified using National Cholesterol Education Program (NCEP) guidelines. Eighty two of 100 surveys were returned, and 75 completed 24-hour dietary recalls. As a group, these surveyed aviators consumed significantly less total fat, saturated fat, and dietary cholesterol than found in the typical American diet. Ninety three percent were non-smokers and 16 percent did not drink alcohol. Twenty eight percent described themselves as overweight by 6-10 pounds. Sixty-two percent exercised aerobically with 56 percent exercising three times a week or more. Monitoring total blood cholesterol level was important to 86 percent of respondents. Using NCEP guidelines, 36 percent of randomly sampled aviators were identified with LDL cholesterol which may warrant dietary or lifestyle intervention. Future research efforts and a proposed approach for educational intervention are discussed for this population. Author (revised)

N93-32258# Spanish Air Force, Talavera AFB.

OBJECTIVE IMPROVEMENTS OBTAINED BY CONTROL OF DIET AND PHYSICAL TRAINING IN SPANISH AIR FORCE FIGHTER PILOTS

JOSE L. GARCIA ALCON, MA DEL ROSARIO DURAN TEJEDA (Extremadura Univ., Badajoz, Spain.), and JUAN M. MORENO VAZQUEZ (Extremadura Univ., Badajoz, Spain.) in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 7 p Mar. 1993

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The effect of diet and sport practice in a homogeneous--age, sex and environmental stress--group of pilots ($n=90$) was investigated in order to evaluate the impact of diet and sport practice on body weight and plasma lipid levels. The dietary intake was a typical mediterranean diet (55-60 percent carbohydrates, 25 percent lipids, and 15-20 proteins and 3000 Kcal daily). It was controlled by the Flight Surgeon Office. The sport practice was grounded in a physical training program for pilots, directed by the Physical Training Officer. A marked difference in all studied lipid parameters was found between groups with free diet versus controlled diet. A difference in HDL-C levels and TC/HDL-C ratio was found between groups with regular physical training versus free sport practice. Author (revised)

N93-32259# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

THE INFLUENCE OF DIETARY COUNSELING AND CARDIAC CATHETERIZATION ON LIPID PROFILES IN AMERICAN MILITARY AVIATORS

TUOMALA, R. MUNSON, W. BESICH, and P. CELIO in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 6 p Mar. 1993

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The purpose was to determine the combined effect of dietary counseling and cardiac catheterization on lipid profiles when compared to a control group that did not receive dietary counseling or cardiac catheterization. The medical records and lipid profiles of 109 military aviators who underwent cardiac catheterization and dietary counseling and 109 matched controls who received neither were reviewed. All individuals were seen twice at the Aeromedical Consultation Service (ACS) between July 1987 and March 1992.

Lipid profiles of the two groups were compared during their first evaluation and again at follow-up. Overall, there was a trend towards improvement in lipid profiles, but the changes between the 2 groups were not statistically significant. The cardiac catheterization group was divided into 3 subgroups based on severity of disease and compared to their matched control. The subgroup with minimal coronary artery disease (max lesion is less than 30 percent) showed a small but statistically significant improvement in HDL cholesterol. Otherwise the aviators knowledge of his angiographic results did not lead to any significant change in lipid profiles. This suggests that lipid profiles in aviators is not significantly affected by the combined influence of nutritional counseling and cardiac catheterization. The design of this study did not preclude members of either group from receiving dietary recommendations from physicians as part of their overall evaluation. Author (revised)

N93-32260# Belgian Air Force, Brussels.

BIOLOGICAL PARAMETERS AND CARDIOVASCULAR RISK FACTORS WITH THE FLYING PERSONNEL OF THE BELGIAN ARMED FORCES

J.-P. VASTESAEGER and P. VANDENBOSCH *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 3 p Mar. 1993

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Research was done into biological parameters and cardiovascular risk factors of all pilots and navigators of the Belgian Armed Forces (Air Force and Light Aviation) of more than 45 years old and was evaluated according to age categories. The evolution of these data was analyzed with a retrograde study. Special attention was paid to the differences between Light Aviation and Air Force and between the respective linguistic groups.

Author (revised)

N93-32261# Royal Norwegian Air Force, Oslo.

CHANGES IN SOME LIFESTYLE PARAMETERS IN NORWEGIAN PILOTS AS STUDENTS, AND AFTER 6 AND 12 YEARS OF SERVICE

I. L. NESLEIN, C. C. CHRISTENSEN, L. LIAN, T. RODE, and H. T. ANDERSEN *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 3 p Mar. 1993

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Medical records from candidates accepted for military training in the Royal Norwegian Airforce (RNoAF) between 1978 to 1980, and who still are on flying standards in the RNoAF, were examined. Cholesterol, HDL-cholesterol, resting heart rate, blood pressure, body weight, and maximum oxygen uptake were studied over a 12 year period, i.e. at approximately 20, 26, and 32 years of age. Our pilots gain weight at a rate twice that of the general Norwegian population. They maintain the same physical fitness from the age of 20 to 26, and from 26 to 32 there is a significant increase in maximum oxygen uptake. A 32 year old pilot is in a distinctly better physical condition, both compared to his younger colleagues, and to the average Norwegian of the same age. There is also a significant increase in serum-cholesterol from the age of 20 to 32. HDL-cholesterol and resting heart rate remained unchanged over the period. Systolic blood pressure was unchanged from 20 to 26, but decreased significantly from 26 to 32. Diastolic blood pressure dropped significantly from 20 to 26 years of age. Dietary/lifestyle consultation, as a matter of routine, may be of great importance to young pilots in order to prevent coronary heart diseases in the future. Such information should be given at an early stage, before symptoms occur. Author (revised)

N93-32262# Centro de Instruccion de Medicina Aeroespacial, Madrid (Spain).

SURVEY OF SMOKING HABITS IN THE SPANISH AIR FORCE

F. RIOS TEJADA, C. ALONSO RODRIGUEZ, J. J. CANTON ROMERO, and J. A. AZOFRA GARCIA *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 7 p Mar. 1993

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Cigarette smoking is a well known cause of major illnesses in the general population, illnesses that can impair a pilot's

performance of duty and even result in temporary or permanent disqualification of the aircrew member. This results in a diminished return on a significant investment of time and resources used to train the individual, a loss that is even more critical as the competition for such resources in an era of budget reduction, becomes more intense. The purpose is to review the diseases and physiologic changes related to cigarette smoking, especially as they relate to the flying environment. Then the prevalence of both the smoking habit and these related impairments in the Spanish Air Force aircrews are specifically examined. Finally, this data is utilized, compared to previous epidemiologic surveys in this target population, to draw conclusions regarding the effectiveness of past efforts at reducing cigarette smoking and propose future methods that might be used to reduce the negative impact of smoking related illness on the SAF mission.

Author (revised)

N93-32263# Army Natick Research and Development Command, MA.

THE EFFECTS OF AN ANTJET LAG DIET

CHARLES A. SALTER, LAURIE S. LESTER, EDWARD HIRSCH, MARGARET MOLINE (Cornell Univ., White Plains, NY.), CHARLES P. POLLAK (Cornell Univ., White Plains, NY.), and DANIEL R. WAGNER (Cornell Univ., White Plains, NY.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 13 p Mar. 1993

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The unpleasant symptoms surrounding jet lag or phase shifts (fatigue, insomnia, etc.) generally interfere with biological rhythms, performance, and subjective well being. A popular 'jet lag diet' has been touted widely as an effective countermeasure to alleviate symptoms through systematic alternation of high (greater than 3600 calories per day) and low (less than 800 calories per day) food intake, timed consumption of methyl xanthines, high protein breakfasts and lunches, and high carbohydrate dinners. Unfortunately, this system as a whole has never been adequately tested with humans. Fifteen male subjects (aged 18-25) lived individually in time-isolation apartments for 15 consecutive days. For the first seven days they ate and slept according to their usual schedule. During the seventh night, they were phase advanced 6 hours, to simulate an easterly jet flight, and maintained their new schedules for 8 days. The eight control subjects consumed their normal diet throughout the study, while the seven diet group subjects consumed the 'jet lag diet' prescribed by Charles Ehret. All subjects experienced jet lag as evidenced by disrupted sleep and body temperature rhythms, mood and performance decrements, and lessened physical activity. The antijet lag diet did not lessen the severity of these symptoms and, in fact, worsened sleep. Although, the two groups did not differ with respect to sleep latency, duration, or composition before the simulated jet lag, afterwards subjects in the diet group slept on average 30 minutes less and were 31 percent less efficient than the control subjects. These results indicate that a popular antijet lag diet is not effective in young male subjects and may even worsen symptoms for air crew members relying upon it.

Author (revised)

N93-32264# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

SUBJECTIVE MOOD AND FATIGUE OF C-141 CREW DURING DESERT STORM

JONATHAN FRENCH, PATRICIA A. BOLL, ROGER U. BISSON, KELLY J. NEVILLE, WILLIAM F. STORM, STEPHEN H. ARMSTRONG, TIMOTHY SLATER, and ROBERT L. MCDANIEL (Military Airlift Wing, 437th, Charleston AFB, SC.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 6 p Mar. 1993

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Profile of Mood States (POMS) data were used to assess the subjective condition of C-141B air crew members during Operation Desert Storm (March/April, 1992). The POMS dimensions used were anger, fatigue, vigor, tension, depression, and confusion. Data were collected during 2 intervals of the MAC crew duty day; legal for alert (LFA) and crew rest (CR) intervals. The POMS dimensions

correlated with one another during the 30-day study. Fatigue, vigor, and confusion were different between LFA and CR suggesting that the CR interval was restorative. During both LFA and CR intervals, cumulative flight hour blocks from 0-75, 76-100, 101-125, and 126-150 hours per month revealed no significant effects on subjective mood states. However, mood was sensitive to conditions of recent (1-2 days) flight hours and sleep hours in combination with cumulative flight hours per 30-days. In particular, when cumulative flight hours exceeded 125 hours per 30-day period, the vigor dimension was affected by the amount of sleep and flight hours in the most recent 24-48 period. Therefore, attending to recent sleep and flight hours as well as cumulative flight hours per 30-day interval may reduce fatigue and improve mood when operational pressures require exceeding the normal 125 flight hours per 30-days. Author (revised)

N93-32265# Air Force Systems Command, Brooks AFB, TX, Armstrong Lab.

C-141 AIRCREW SLEEP AND FATIGUE DURING THE PERSIAN GULF CONFLICT

PATRICIA A. BOLL, WILLIAM F. STORM, JONATHAN FRENCH, ROGER U. BISSON, STEPHEN D. ARMSTRONG, TIMOTHY SLATER, WILLIAM E. ERCOLINE (Krug Life Sciences, Inc., San Antonio, TX.), and ROBERT L. MCDANIEL (Military Airlift Wing, 437th, Charleston AFB, SC.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 13 p Mar. 1993
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Subjective fatigue ratings and sleep logs were collected from pilots flying C-141 strategic airlift missions during Operations Desert Shield and Desert Storm. Descriptive summaries of the data are presented for duty-day, crew rest away from home base, and crew rest at home base. The implications of selected findings are presented as recommendations on management of aircrew work/rest schedules during sustained airlift operations. Author

N93-32266# Army Aeromedical Research Lab., Fort Rucker, AL.

THE EFFECTS OF COCKPIT HEAT ON AVIATOR SLEEP PARAMETERS

J. LYNN CALDWELL, ROBERT THORNTON, JACQUELYN Y. PEARSON, and BARBARA L. BRADLEY *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 10 p Mar. 1993
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Aviators are frequently required to work in hot environments while performing the complex cognitive tasks necessary to fly their aircraft. Objective measures of sleep were taken to determine the effects of exposure to high cockpit temperatures. Army helicopter pilots were required to fly a UH-60 simulator while wearing NBC IPE in temperatures of 35 C and 41 C. Additionally, various cooling vests were tested to determine if these cooling mechanisms would alleviate any heating effect seen in sleep parameters. During the day, pilots flew the simulator continuously for 6 h unless they were withdrawn because of excessive core temperature or they voluntarily withdrew. During the night, pilots slept in a cool bedroom in the laboratory while their sleep patterns were recorded by electroencephalography. Analyses of the data indicated when core body temperature rose during the flight by at least 1 C and the flight was at least 5 h in length, rapid eye movement (REM) sleep was significantly reduced. No rise in slow wave sleep (SWS) was seen although there was a tendency for the relationship between SWS and REM sleep to be altered. The results suggest aviators operating in a hot environment for a long period of time may have altered sleep the following night. Author (revised)

N93-32267# Centre National de la Recherche Scientifique, Paris (France).

HUMAN FACTORS AND THE SAFETY OF FLIGHTS: THE IMPORTANCE OF THE MANAGEMENT OF SLEEP [FACTEURS HUMAINS ET SECURITE DES VOLS: IMPORTANCE DE LA GESTION DU SOMMEIL]

P. CABON, R. MOLLARD, A. COBLENTZ (Paris V Univ., France.), J. P. FOUILLOT (Paris V Univ., France.), and J. J. SPEYER (Airbus Industrie, Toulouse, France.) *In* AGARD, Nutrition, Metabolic

Disorders and Lifestyle of Aircrew 11 p Mar. 1993 *In* FRENCH

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In the field of civil air transport, the fatigue and sleep of the pilots becomes more and more of a concern in the area of flight safety, in particular for long distance flights. Indeed, these flights produce important stresses for the pilots: fast and multiple time shifts, work at night or with shifted schedules with occasionally very high amounts of work. The cumulated effect of these stresses involves disturbances of the circadian rhythms and sleep deprivations reducing the performance and the alertness level of the pilots. These difficulties are particularly elevated by the lengthening of the duration of flights with the modern planes such as the Boeing 747-400 and Airbus A340 (flights can attain a duration of 14 hours). These flights which remain for the moment limited to certain types of routes will tend to become more common in the near future. They are carried out with a reinforced crew, the French regulation of civil aviation prohibiting the work of pilots beyond one period of 8 or 10 hours according to the type of aircraft. The relatively recent appearance of these aircraft raises the very delicate question of the management of sleep for the whole crew, during the stopover and the flight. To these physiological constraints, it is necessary to add the modifications of the activity of piloting on the modern aircraft. Sometimes the increasing automation of the cockpits contributes to making the tasks of the pilot very monotonous as well as reducing the sensory stresses considerably. Similar work was also carried out in the military field. The cumulated action of these two factors, sleep disturbances and monotony of activity, are likely to involve states of hypovigilance which can appear, in certain circumstances, prejudicial to the safety of the flight. The results of research aimed at the study of the duration and quality of sleep of the crews of civil aircraft during rotations including long distance flights of durations equal to or greater than 8 hours. Transl. by FLS

N93-32268# Air Force Systems Command, Brooks AFB, TX, Armstrong Lab.

DIGITAL FLIGHT DATA AS A MEASURE OF PILOT PERFORMANCE ASSOCIATED WITH FATIGUE FROM CONTINUOUS OPERATIONS DURING THE PERSIAN GULF CONFLICT

ROGER U. BISSON, KELLY J. NEVILLE, PATRICIA A. BOLL, JONATHAN FRENCH, WILLIAM R. ERCOLINE (Krug Life Sciences, Inc., San Antonio, TX.), ROBERT L. MCDANIEL (Military Airlift Wing, 437th, Charleston AFB, SC.), and WILLIAM F. STORM *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 11 p Mar. 1993

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The results of a field study using the C-141 Digital Flight Data Recorder (DFDR) to evaluate whether fatigue affected piloting precision during the Persian Gulf conflict are described. This is the first time digital flight data from the C-141 was used to evaluate routine aircrew performance. Five C-141 military transport crew were granted scheduling priority to quickly accumulate 50 flight hours in less than 30 days. Fatigue estimates were based upon activity logs, fatigue ratings, oral temperature, and mood surveys. Eighty seconds of the instrument landing system (ILS) final approach above decision height were isolated from digital flight data downloaded after each flight. Both an average and a standard deviation were calculated for airspeed, heading, vertical velocity, pitch, and roll for each of the 80 second ILS segments. The standard deviations served as estimates of piloting precision and were correlated to fatigue measures. No significant differences in piloting precision categorically attributable to fatigue were found. However, individual examples of decreased precision associated with high fatigue levels were observed. These deviations did not occur with enough regularity to conclude whether fatigue or other factors were the root cause. DFDR data can be a sensitive measure of performance, but the operational setting of Desert Storm did not permit control of important variables in this first time effort. The findings suggest that DFDR assessment of flying precision could be of value in controlled studies of fatigue, workload, or

drugs that affect pilot performance. Future studies need to evaluate digital flight data versus other cognitive and psychomotor tasks that are sensitive to changes in performance. Transl. by FLS

N93-32269# Army Natick Research and Development Command, MA. Military Performance and Neuroscience Div.

EFFECTS OF CAFFEINE ON MENTAL PERFORMANCE AND MOOD: IMPLICATIONS FOR AIRCREW MEMBERS

HARRIS R. LIEBERMAN, BERNARD J. FINE, JOHN L. KOBRICK, and JOHN D. E. GABRIELI (Stanford Univ., CA.) in AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew 10 p Mar. 1993

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Caffeine is generally regarded as the most widely used drug in the world. However, it is also a food constituent. Its acute effects on behavior appear to be greater than those of any other food constituent as they are detectable when caffeine is administered in doses found in single servings of coffee, tea, and soft drinks. Caffeine affects the central nervous system by binding to adenosine receptors, and it has acute and chronic, dose dependent effects on brain function. Low and moderate doses have beneficial effects on mental performance but high doses may have adverse effects. Tolerance develops to continued use of caffeine, so that its acute effects are altered when it is used chronically in high doses. Physical and mental symptoms associated with sudden withdrawal of caffeine have also been reported. The acute effects of caffeine on vigilance, simple and complex cognitive performance, and mood state are discussed. Doses equal to single servings of beverages consistently improve auditory and visual vigilance. In addition, moderate doses of caffeine increase self-reported alertness. The duration and magnitude of these effects on individuals are related to habitual caffeine consumption and interact with tobacco use. In view of its dose-related beneficial and deleterious effects, aircrew personnel, flight surgeons, military commanders, and planners should have knowledge of the potential influence of caffeine on performance, especially vigilance, and mood, as well as the consequences of its abrupt withdrawal. Author (revised)

N93-32328*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

HEALTH MAINTENANCE FACILITY SYSTEM EFFECTIVENESS TESTING

CHARLES W. LLOYD, JOHN GOSBEE (Krug Life Sciences, Inc., Houston, TX.), RICHARD BUEKER (Krug Life Sciences, Inc., Houston, TX.), DEBRA KUPRA (Krug Life Sciences, Inc., Houston, TX.), and MARY RUTA (Krug Life Sciences, Inc., Houston, TX.) Jul. 1993 111 p

(NASA-TM-104737; S-638; NAS 1.15:104737) Avail: CASI HC A06/MF A02

The Medical Simulations Working Group conducted a series of medical simulations to evaluate the proposed Health Maintenance Facility (HMF) Preliminary Design Review (PDR) configuration. The goal of these simulations was to test the system effectiveness of the HMF PDR configurations. The objectives of the medical simulations are to (1) ensure fulfillment of requirements with this HMF design, (2) demonstrate the conformance of the system to human engineering design criteria, and (3) determine whether undesirable design or procedural features were introduced into the design. The simulations consisted of performing 6 different medical scenarios with the HMF mockup in the KRUG laboratory. The scenarios included representative medical procedures and used a broad spectrum of HMF equipment and supplies. Scripts were written and simulations performed by medical simulations working group members under observation from others. Data were collected by means of questionnaires, debriefings, and videotapes. Results were extracted and listed in the individual reports. Specific issues and recommendations from each simulation were compiled into the individual reports. General issues regarding the PDR design of the HMF are outlined in the summary report. Author (revised)

N93-32356*# Sverdrup Technology, Inc., Huntsville, AL.

MICROBIOLOGICAL AND CORROSION ANALYSIS OF THREE URINE PRETREATMENT REGIMES WITH TITANIUM 6A1-4V Interim Report

TIMOTHY L. HUFF Jul. 1993 26 p

(Contract NAS8-37814)

(NASA-CR-192575; NAS 1.26:192575) Avail: CASI HC A03/MF A01

One objective of the water recovery test (WRT) performed at NASA's Marshall Space Flight Center (MSFC) for the environmental control and life support systems (ECLSS) of Space Station Freedom is to determine the ability of the water recovery system to reclaim urine for crew reuse. In the process, raw urine is pretreated using a commercially available oxidant, Oxone (DuPont), and sulfuric acid (to reduce ammonia), and pumped into a urine processing subsystem. A combination of sodium hypochlorite and sulfuric acid were also considered as an alternative pretreatment. The ability of these pretreatments, plus a third pretreatment of ozone, to reduce microbial levels in urine generated during testing of the water recovery system at MSFC was examined. In addition, the corrosion rate of weld and base metal specimens of titanium 6A1-4V, a candidate material for the water system of Space Station Freedom, was monitored in the presence of these pretreatments. Specimen surfaces were examined at completion of the 21-day test using scanning electron microscopy. Change in pH, color, turbidity, and odor were recorded over the course of the test.

Author (revised)

N93-32406# Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil).

UTILIZATION OF HIGH ENERGY ELECTRON BEAM IN THE TREATMENT OF DRINKING AND WASTE WATER

MARIA HELENA DEOLIVEIRASAMPA, S. I. BORRELY, and D. M. MORITA (Sao Paulo Univ., Brazil.) Aug. 1991 17 p Presented at the First Brazilian Meeting on Nuclear Applications, Recife, Brazil, 27-30 May 1991

(DE92-642335; IPEN-PUB-341; CONF-9105279) Avail: CASI HC A03/MF A01 (US Sales Only)

Samples of drinking water and waste water were irradiated using high energy electron beam with doses from 0.37 kGy to 100 kGy. Preliminary data show the removal of about 100% trihalomethanes (THM) in drinking water concentration from 2.7 micro-g/l to 45 micro-g/l, 90% of the color of the Public Owned Wastewater Treatment Plant effluent and 87% of oil and grease of the cutting fluid waste water. DOE

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A93-47125

FLAVINE-DEPENDENT PROCESSES IN MODEL PREBIOLOGICAL SYSTEMS (FLAVINOZAVISIMYE PROTSESSY V MODEL'NYKH PREDBIOLOGICHESKIKH SISTEMAKH)

M. P. KOLESNIKOV (RAN, Inst. Biokhimii, Moscow, Russia) Rossijskaya Akademiya Nauk, Izvestiya, Seriya Biologicheskaya (ISSN 0002-3329) no. 6 Nov.-Dec. 1992 p. 844-853. In RUSSIAN refs

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The paper presents results of a study of flavine-dependent processes occurring with the participation of microspheres and liposomes containing flavoproteinoid-1 or -2. It was found that the presence of flavoproteinoid-containing microspheres or liposomes catalyzed the photooxidation of glycolate and the photoreduction of NAD⁺ to NADH and sensitized the photophosphorylation of ADP to ATP, indicating that all these processes are flavine dependent.

It is suggested that the flavoproteinoid-containing microspheres and lipospheres can be used as a simple model for prebiotic investigations.

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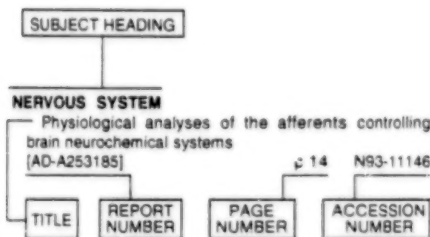
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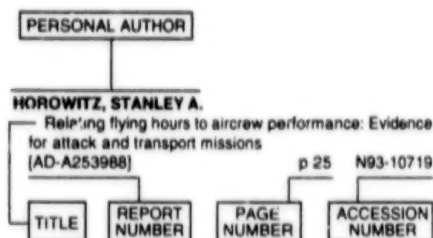
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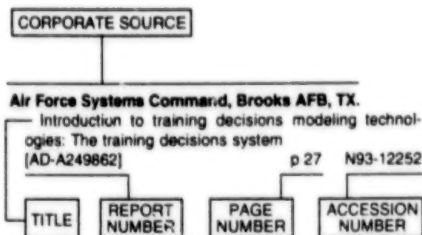
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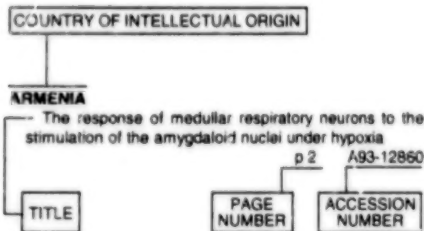
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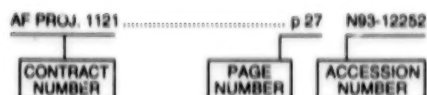
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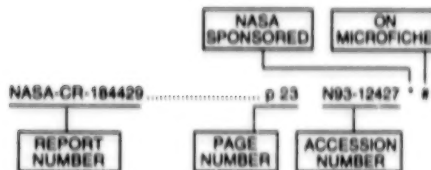
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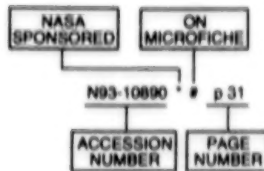
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